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AGRICULTURAL RESEARCH INSTITUTE
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PRIZE-ESSAYS

AND

TRANSACTIONS

OF THE

HIGHLAND SOCIETY OF SCOTLAND.

NEW SERIES,

VOL. I.

WILLIAM BLACKWOOD, EDINBURGH; AND
T. CADELL, STRAND, LONDON.
MDCCCXXIX.

1829

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AND

TRANSACTIONS

OF THE

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VOL. VII.

WILLIAM BLACKWOOD, EDINBURGH; AND
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Premiums offered by the Society in 1828.
Ditto Ditto in 1829.

ERRATUM.

Page 400, line 22, *for* doctrine, *read* system,

PRIZE ESSAYS AND TRANSACTIONS

OF

THE HIGHLAND SOCIETY OF SCOTLAND.

PRELIMINARY NOTICE.

To supply the intervals between the publication of the successive volumes of its Transactions, the Society has been in the practice of prefixing to each a summary view of its proceedings since the publication of the preceding volume. But although the subjects which occupy its attention have been greatly multiplied, it will not perhaps be now necessary to attempt the same minuteness of detail as on several former occasions.

The important object of extending the Woodlands of Scotland, has occupied, in a particular manner, the attention of the Society; for, in consequence of the long continued labours of man, and from other causes, which generally aid nature in the destruction of forests, and thwart her in reproducing them, many parts of our country have now become as remarkable for their destitution of wood as they were for the impenetrable forests in a former age. The reports, however, which the Society has had the gratification of receiving on the progress of young plantations, in many parts of Scotland, induce the belief, that we need not seek for an unfavourable change of climate, to account for the change of our country as to the growth of wood; but that, if the native trees, or those of analogous climates, be planted with sufficient care, and in sufficient masses, many districts of our country, in which planting has often been deemed impracticable, may again be covered with wood. During the period, indeed, to which this notice refers, the Society has had opportunity of observing, that trees possess a tenacity of life which enables them, when properly treated, to survive, under circumstances which were formerly regarded as fatal in this climate. From the report of a Committee, deputed to inspect the effects of transplanting trees, as practised by Sir Henry Steuart, Bart. at Allanton, it appears that trees of many sorts, and of considerable age, under his judicious and scientific management, suffer by transplantation only one or two years at most, while the growth of the succeeding years is unusually luxuriant.

But from whatever causes the destruction of the native wood of our country may have arisen, the attention of the Society was called to another cause, which seemed to produce a similar effect upon *planted* wood. Complaints were long made as to the inferiority of the timber, and the premature decay of the trees of certain species, of recent growth, compared with those from native forests, particularly the Scotch fir (*Pinus sylvestris*), and the larch (*Pinus Larix*), which, though like most other plants they affect particular soils and situations, seemed to owe their degeneracy to some other cause. On inquiry, it was found that too little attention had been paid to the collecting of proper seed; that some of the worst varieties or species produce cones in greatest abundance, and, consequently, would be most resorted to by those nurserymen whose chief object was immediate profit. To prevent this evil, the Society offered premiums for seed from the native forests of Scotland, of Norway, and the Alps, hoping that the degeneracy may thus be prevented, by the establishment into a practice of that which was thus proposed as an experiment *.

It is not here possible to mention in detail the numerous subjects relating to the general improvement of Agriculture, towards which the funds and attention of the Society have, of late, been directed. For these, the Lists of Premiums, annually published, must be referred to, as shewing the subjects proposed for investigation or experiment; such are Draining, whether applied to the pastoral or cultivated districts of the country—the reclaiming of Waste Lands—the culture of particular crops in the remote districts where they have been hitherto little known, or where their proper mode of culture has been imperfectly understood —an extension of the knowledge of the best practices in relation to the feeding our domestic animals, and to the species of food best suited to them, under the peculiarities of climate, soil, and situation, in which they are placed; while the application to the purposes of the arts of certain native productions, as *Kelp*, *Zostera marina*, and the like, has also formed a part of the Society's endeavours at the general improvement of our country. The subject of kelp, indeed, has occupied the Society's attention from the very commencement of its labours, not only as the means of increasing the value of property, and consequently of attracting capital to the Islands and Highlands of Scotland, but as keeping open a source of profitable labour to an industrious and hardy native population. The object chiefly attempted was the directing attention to a more careful and judicious preparation of the material from the native sea-weeds, with a view to increase the quantity of carbonated alkali which it might yield, and to enable it to stand a competition in the market with the barilla of commerce. Notwithstanding of all these exertions, and the favourable results that long seemed to attend them, the Society has now to deplore the present depressed condition of this object of national industry, and the injurious effects of its decline upon the numerous population dependent upon it for support. The subject of the *Zostera marina* is comparatively unimportant. This, though not a sea-weed, grows abundantly about low water-mark, on many of our remote coasts and estuaries; and having, at the same time, been imported in considerable quantities from the Continent, to be used as a substitute for hair in stuffing matrasses, and for similar purposes, the Society offered premiums which were awarded, for producing the native article in a state fit for the arts.

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* As connected with the woodland of the country, it may be mentioned, that some members of the Society proposed, that its attention should be directed towards the introduction again into our country of the Capercaillie, or Cock of the Wood, the *Tetrao urogallus* of Linnæus, and *Urogallus vulgaris* of Fleming's British Animals. This noble bird, which is the largest of the grous tribe, measuring 2 feet 7 inches in length, and weighing 12 or 13 pounds, is still abundant in the forests of the north of Europe, but has not been seen in our own country since 1748, though it kept a place in Ireland several years later. Attempts have lately been made to effect its introduction again, but it is a difficult matter to alter the relations which naturally subsist between the wild animals of a country, and the state of its population and surface.

The importance of attending to the indigenous Grasses has lately been brought under public notice by some highly interesting publications, among which may be mentioned as standing in the first rank, Mr Sinclair's admirable account of the series of experiments conducted by him under the munificent patronage of the Duke of Bedford *. On examining the plants which constitute any old rich pasture, it is found that they consist of a number of different species of grass, which have established themselves there, in the course of nature, by displacing, or replacing when they had died out, the artificial grasses which had been sown. In some places, much attention has of late been happily bestowed in sowing down the seeds of these permanent grasses at once, which is found to anticipate the process of nature by several years; and in the work alluded to, the grasses which are found naturally grouped on different soils, as well as their economic value, are fully illustrated. With such facilities for ascertaining the species best suited for laying down lands in perennial pasture, the Society has endeavoured, by a variety of premiums, to direct attention to a department of rural economy which has not received the same attention in Scotland as some other branches of husbandry, although the Society is deeply impressed, at the same time, with the vast importance of the artificial grasses, and of the alternate husbandry, as that indeed which forms the characteristic excellence of Scottish agriculture.

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* "*Hortus Gramineus Woburnensis*; or, an Account of the Result of Experiments on the Produce and Nutritive Qualities of different Grasses and other Plants, used as Food for the more valuable domestic Animals." Instituted by John Duke of Bedford, by George Sinclair, F. L. S., F. H. S., &c.

The productions of the Dairy have been considered of recent years as of sufficient importance to demand no small share of the Society's attention. A great variety of premiums has been awarded for improving the quality of Cheese, by imitating the finer kinds made in England. The results have been eminently satisfactory, and the imitations produced have been sufficient to convince the Society of the great improvement of which this department of dairy management is susceptible. The subject of Butter has, in a like manner, particularly in what relates to curing and preserving it, been under the consideration of the Society; and the reports which have been successively received, have announced a remarkable progressive improvement that has taken place under their encouragement.

The reduction of the salt-duties has given a considerable stimulus to another important branch of industry interesting to agriculture, namely, the curing and exporting of Beef and Pork. It was observed in the introduction to a preceding volume, that, immediately on facilities being offered by the reduction of the duty, the attention of the public was called to this trade, by the offer of liberal premiums; and the Society has had reason to be gratified with the results, as evinced by the establishment of the trade in districts in which, though it be well suited to them, it was previously unknown. As connected with this subject, those premiums may be adverted to which were offered for experiments on the refining or purifying of salt, with a view to removing the bitter taste which it occasionally imparts to the cured provisions, and to which the attention of those who cure butter so successfully has been long directed. This bitter taste, which seems to arise partly from contaminations received on the shores (for it is not so great in water taken from the deep sea), and partly from other salts, besides common salt, which exist in sea-water, may be successfully removed in the more expensive modes of preparing salt for the purposes of cookery; but to do so economically on the great scale is still a desideratum in the arts.

Several years ago, the attention of the Society was called to the advantages of the mode of reaping practised in Flanders, by means of the instrument called the Hainault or Flemish Scythe; and with a view to ascertain its real value, as compared with the sickle, two young Flemish farmers were invited to come over and exhibit its use in the different districts of Scotland during the harvest of 1825. M. le Chevalier Masclet, consul-general of France, who had already given his aid in effecting the arrangements, consented to accompany the Flemings on their tour; and through his polite attention to the inquiries of every one, and the industry of the Flemings, an opportunity was afforded to the farmers of the principal agricultural districts of Scotland, of witnessing the use of the instrument, and of comparing it with that at present in use. The favourable impression of its value which this experiment left, has since induced several local associations to offer premiums for its introduction.

The improvement of our various Live Stock, and the diffusion of every kind of information which may tend to this object, continues to receive the anxious attention of the Society. In the husbandry of many districts of Scotland, the rearing of cattle and sheep must ever continue to hold the first place; and, in these situations, there are native breeds admirably suited to the circumstances under which they are placed. It has accordingly been the object of the Society to preserve the purity, and increase the value, of these native races, not less than to introduce the finer and larger breeds, wherever practicable and expedient. For the first of these objects, it has been the practice of the Society, from its earliest institution, to establish and support local or District Shows of Live Stock, under the management of those members who reside in the districts; and it is gratifying to find, that these meetings continue to fulfil the purposes contemplated,—to excite emulation, to diffuse a spirit of improvement, and to cherish a reciprocity of good feeling between the landowners and tenantry.

Under these circumstances, the Society, within the period to which this notice refers, has extended the number of its local competitions. The General Shows of live stock, at which an opportunity is afforded of bringing forward all the improved breeds suited to the country, though as yet considered only as experimental, have been held annually in Edinburgh or in Glasgow, with increasing interest, and have been rendered more attractive and useful by the extensive exhibitions accompanying them, of new and improved implements, seeds, roots, and other objects interesting to the agriculturist. Attempts have been made by the Society to improve the very peculiar breed of the Zetland Sheep, on account of the quality of the fleece; while some public spirited individuals have partially introduced the fine woolled breeds of Spain and Saxony, though the expediency of doing so has not yet been decided by the trials which have been made.

The Society has also directed its endeavours not a little towards the encouraging and perfecting the Native Straw Plait Manufacture, of which the specimens produced from time to time warrant the conclusion, that, even in the Northern Islands, we may not only imitate, but rival, the productions of Italy.

Various suggestions, founded on appeals to the patriotism of members, have, at various times, been made for using manufactures of native, rather than of foreign production. The practicability, if not the expediency, of such plans, may often be questioned; but the case of this beautiful manufacture, is perhaps one where it may be put to the feelings of British ladies, whether they will not rather patronize the industry of their own countrywomen, than resort to a foreign luxury. It requires but a slight knowledge of the changes which machinery has produced upon the labour of our population, to learn that our female peasantry have not now the same resources of domestic manufacture as they formerly possessed, and that there is, in consequence of a transference of labour, much unemployed time upon their hands, which induces the poverty accompanying idleness, and the demoralisation which willing industry suffers, when it is left without material on which to work. At the same time, articles formerly of cottage manufacture, are now produced so much more easily, that they could be purchased by the peasantry at a much cheaper rate than they could be wrought, so that the comforts of the entire class would be increased, were other branches of industry discovered, with the rewards of which they might go to the market. It is therefore a most legitimate field for philanthropic ingenuity to attempt to supply the present blank in cottage economy, and the straw-plait manufacture as promising to aid in doing so, has accordingly been well attended to by the Society, and with every prospect of a favourable result.

With a similar object in view, the Society has offered premiums for the encouragement of the Bee Husbandry, the improvement of the condition of Cottages, and other branches of their economy. Perhaps the true climate of the bee is somewhat different from that of Scotland; yet, in sheltered situations in this country, the bee propagates abundantly, and stores up, during the summer months, a very considerable weight of honey. The Society, by directing the attention of cottagers to this department of husbandry, may hope to add something to the enjoyments of a class of the community which, on every ground, is entitled to the first consideration. It is observed of the manufacturing classes, that they are not only always alive to every opportunity of making their wages as high as the competition of their numbers will permit; but, generally speaking, they spend their wages as fast as they are earned, raising and lowering their standard of enjoyment with the oscillations of commerce, and passing rapidly from luxury to pauperism; while the peasantry, though they are not deficient in a knowledge of their rights, and receive wages regulated by the same laws as the town population, yet, instead of requiring to be restrained, like the latter, seem to require to be encouraged to better their condition, and elevate the standard of their enjoyment. As connected with this subject, it may be observed, that various applications have been made to the Society, both by public bodies and by individuals, for pecuniary aid in carrying into effect plans for the education of the inhabitants of the very remote districts of Scotland. But although the Society entertains the most favourable wishes for the success of every measure calculated to effect this important purpose, and has always been ready to give any recommendation to its members individually to promote it, the terms of its charter preclude it from directly so employing its funds.

A considerable portion of the sixth volume was occupied with the results of the Society's investigation into the rate of sickness among the members of Friendly Societies, and with numerous rules and tables illustrative of the principles on which alone these institutions can be permanently and beneficially conducted. It is gratifying to learn, that the labours of the Society on this subject were soon duly appreciated; and that several Friendly Societies have been already instituted in Edinburgh, Glasgow, and various places in the country, upon greatly improved principles; besides many others which are at present in progress. In 1825, the Society, with a view still farther to promote facility and accuracy in their management, offered Premiums to the Schoolmasters of Scotland, and their Scholars, for the best system of Friendly Society Book-keeping. By all those measures, tolerably correct data have been obtained for the guidance of Friendly Societies, and a spirit of inquiry and desire for their improvement have been excited among their members, which cannot fail to be productive of a beneficial change in the schemes of these very useful institutions.

In the sessions of 1825 and 1827, the House of Commons appointed Committees to inquire into the rates of sickness and mortality, and other matters connected with Friendly Societies. The result of their investigations is a bill now before Parliament for regulating the rates of contributions and benefits of societies in England and Wales; but it seems to have been considered unnecessary to extend the provisions of the act to Scotland.

Although aware of the evil consequences of too strongly perpetuating national and provincial distinctions in so important a particular as the spoken language of a country, the Society has long directed its attention to a work alike interesting to the philologist, the historian, and the antiquary,—the compilation of a complete Dictionary of the Scoto-Gaelic language. This magnificent work, which comprehends a Gaelic-English and English-Gaelic Dictionary, with a Latin and Gaelic Vocabulary, is now almost ready for publication. It is often a matter of deep regret to the philosopher, when tracing back the history of his race to its earlier eras, that the remains of antiquity are so few; and he has often to discover the humbling fact, that, save a word or two of an unknown language, a whole nation has vanished alike from the earth and the memory of its present population. Man cannot alter the order of nature, or impart immortality to that which time is rendering evanescent; but he may delineate it in the page of history—and thus, when the object is gone, hand down an image of it to posterity, for many ages. That the Celtic was once the language of the greatest part of Europe cannot be denied, while many would extend its limits far beyond it, to the East and the South. But now, though its footsteps are still seen in the names of many places, it has been expelled by other tongues, and has taken refuge in the Highlands of Scotland, as a sanctuary in which it may expire. There it is still cherished and honoured by the fondness of patriotism, and the Highland Society has seized the happy moment for treasuring up in its archives the words which, though still spoken, may soon cease to be heard, and preserving the seal of a decaying record which once spread over Europe. The execution of this great work has occupied the attention of a Committee of the Society since the year 1814, and nearly L. 4000, subscribed by individuals at home and abroad, or voted from the funds of the Society, have been expended in completing the work, and carrying it through the press.

The donation of L. 1000 for the purpose of educating the younger sons of Highland gentlemen for the Royal Navy, placed under the directions of the Society by its original President the late Duke of Argyle, has now, with the accumulated interest, since 1806, been brought into operation, and a series of useful regulations laid down for fulfilling the intentions of the noble donor.

The Veterinary School, which was instituted by the Society now five years ago, continues to flourish with increasing interest. It is rather singular that though our live stock are distinguished above those of most other countries, yet we are not equally attentive to their pathology. The good roads, climate, and keep, of Britain, have probably prevented the frequency of many diseases, which in other places are almost regarded as constitutional; and the wealth of the owners has better enabled them to sustain losses by disease, than in other countries. But these are certainly no excuses for remaining ignorant of the veterinary art, which is just as valuable in relation to the domestic animals, as medicine and surgery are to man. The practice is indeed more difficult, in this respect, that the symptoms must be gathered without those verbal inquiries which the physician may make; but there are evidences enough, independently of speech,—and though the art may not be so far advanced, it admits, with equal certainty, of fixed and scientific practice. It is more simple in other respects, as the number of diseases to which the domestic animals are subject are fewer in number, their constitutions are stronger, and better able to bear more powerful medicines, and to overcome more inveterate diseases. Its importance is indeed proved by the fact, that many persons are met with over the country for whose practice there is a demand, though they often be equally ignorant of drugs, diseases, and the anatomy and functions of quadrupeds. In these circumstances, the Society invited young men from the country, to be instructed by their lecturer in the science and practice of the art, while the lectures were open to all who wished to study, whether from professional motives, or from a laudable curiosity; and during last winter, the courses were attended, not only by a number of professional people, but by a great many gentlemen who were interested in the subject.

During the interval to which this report refers, the Society has felt it to be its duty to bring under the consideration of Government, the recent acts of Parliament for establishing uniformity of weights and measures. However desirous to afford all that assistance which its influence can command in Scotland, in carrying into effect the intentions of the Legislature in relation to this important measure, the Society has been forced to the conclusion, that the provisions of the act, as it now exists, are, in many particulars, inefficient as regards the purposes contemplated, and even calculated to produce increased embarrassments in the various transactions of domestic trade. These circumstances, however, are fully embraced in the memorial transmitted to his Majesty's government; and the subject continues to occupy the attention of the Society.

The duty on clover-seeds, also, which gave a very partial protection to a few districts in England, and that on the importation of tree seeds, were severally the subjects of memorials to Government; while the attention of the Society has also been called to the state of the law which regulates seaborne slates, and which, as it now stands, is very ill suited to the coasting-trade of Scotland.

The Society has continued to cultivate and extend its correspondence with similar Institutions on the continent. Such an intercourse is no less agreeable than beneficial, tending equally to produce an exchange of favours and national friendships; and it is happy in acknowledging its obligations to foreign societies for the information afforded, and the books which have been presented to the Society's Library. For contributions of a like nature from societies and individuals in the United Kingdoms, maps, agricultural productions, models of machines, and the like, the Society has also to render its acknowledgments. By these and other means, the Museum now contains many models of machines connected with agriculture, of which, as far as they are new and valuable, plates and descriptions will be given from time to time, for which, along with the other objects of the Society's attention, very frequent opportunity will now be afforded by the publication of some part of its Transactions four times a-year.

The Prize Essays and Transactions of the Society have hitherto been published in large volumes, at intervals, regulated by the quantity of matter on hand which might be deemed interesting to the public; but the increased sphere of the Society's operations, which makes it now to be regarded as the great National Society for Scotland, and the many communications of general interest which are constantly made to it, have long rendered it expedient that means should be adopted for communicating its proceedings to the public, in some more accessible form, and through some more regular channel. The method which, after long consideration, has been resorted to as the best calculated to attain this end, will be sufficiently explained by the circumstances under which a portion of the Transactions now appears. It will be seen that the Society proposes to avail itself of the Quarterly Journal of Agriculture as the medium for conveying these Transactions to the public; and, considering the favourable circumstances under which this new Work has been commenced, and the eminent talents and accomplishments of the gentleman * who has undertaken to conduct it, the Society has reason to entertain a strong hope that its own papers, while they may have a more general circulation, will derive an additional interest from the great variety of matter which will accompany them.

* J. G. MACVICAR, A. M., &c

HIGHLAND SOCIETY HALL,
EDINBURGH, *April* 18. 1828.

ESSAYS UPON THE BREEDING OF LIVE STOCK, AND ON THE COMPARATIVE INFLUENCE OF THE MALE AND FEMALE PARENTS IN IMPRESSING THE OFFSPRING.

[In the year 1825, the Highland Society proposed as the subject of Prize Essays, the solution of the question, "Whether the breed of live stock connected with agriculture be susceptible of the greatest improvement, from the qualities conspicuous in the male, or from those conspicuous in the female parent?" Four Essays were received, to which premiums were awarded. One of these is now published, as it was transmitted by the author; and of the other three a short account is also subjoined.—Edit.]

Essay I.—*By* John Boswell Esq *of Balmuto and Kingcausie.*

> Te quoque, magna Pales, et te memorande canemus
> Pastor ab Amphryso.—Virgil.

The very great utility of a clear knowledge as to the best method of improving the breed of live stock, connected with agriculture, must be apparent to all; and as one heartily devoted to agriculture in all its branches, I cannot help congratulating the farmer on the information he is likely to receive on so important a subject through the endeavours of the Highland Society. As this subject has long (I may say from my earliest youth) been one in which I have taken the greatest delight, and on which I have bestowed much thought, besides having had very great opportunities of seeing experimentally the changes produced on stock from crossing, and other circumstances, I trust I may be justified from any charge of self assurance, in offering a few facts in as short and succinct a manner as the nature of the subject, and my own inexperience as an author, will permit; being well aware that facility of communicating knowledge is almost as necessary as experience, in order to shine as an essayist.

Hoping, then, for candour in weighing the various facts I shall bring forward, and deprecating criticism as to the manner in which they are brought together (being a mere farmer, and no author), I shall lay before the Society such as occur to my recollection.

The Society has put the question, "Whether the breed of Live Stock, connected with agriculture, be susceptible of the greatest improvement from the qualities conspicuous in the male, or those conspicuous in the female parent?"

The first thing to be done is to answer the query put by the Society, and having done so, to prove by facts that the answer given is the proper one. I have not the slightest doubt in my own mind that the answer ought to be, "the Male *." But before proceeding to prove this, I would warn all who may turn their thoughts to the subject, that it must be an enlarged view of this or any other matter connected with nature, which alone can give a true knowledge as to the point at issue. The fable of the fly on the building ought never to be forgotten; and the stock of a country or a district can only lead to the true result as to any particular breed. I would also remark, that, before the breed of a country can be improved, much more must be looked to than the answer to the question put by the Highland Society; such as crossing, selection of both parents, attention to pedigree, and, lastly, food and care of the offspring.

I shall endeavour to explain my ideas on these heads; and then, having given some proofs as to the male being the parent having the greatest influence on the progeny, I shall endeavour to prove, that, whether I be right or wrong, still the

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* It often happens that an author who has distinctly espoused one side in a question so difficult as this, feels disposed, after the lapse of two or three years, to modify, or even alter, his opinions; but it is consistent with our knowledge, that the accurate observations and farther experience of two years have only strengthened the author of this Essay in the assertions which it contains.—EDIT.

male is the parent which we must look to, as best calculated to improve the breed of any country.

The art of improving the breeds of different animals was almost, if not altogether, unknown to the ancients. Virgil, who seems to have paid some attention to it, has stated things which experience has since taught us are erroneous. In this part of the island it has yet to be introduced, and we are forced to go to England for authorities on the subject. A few of our countrymen have indeed, of late years, come forth, as it were,—and in this number we must rank Mr Stirling of Keir, Mr Robinson of Ladykirk, and Mr Rennie junior of Phantassie, who have seen the value of improved stock, and of attending to pedigree, or breeding from parents, "de bonne race," as the French well express it: but with the exception of these, and some few others, we are yet miserably behind. The very term "a great breeder," signifies two totally different things in England and Scotland: in the former, it means a judge, and one who delights in improved breeds; in the latter, a person who has a great number of (commonly speaking) half-starved calves or miserable lambs, and in whose stock we may see every variety of shape and colour. We have only to look to any drove of Scotch beasts on the road, to satisfy ourselves of the want of all care in our breeders. The cattle are of all different shapes, some with horns, and some without; and if you inquire at the owner, you will find that he purchased some of those dissimilar beasts, not from different breeders, nor in different districts, but from the *same farmer*—and his whole cattle in one fair. How and why is this? Because our Scotch farmer is ignorant of his own trade! They all know and admit, that "breeding-in-and-in," or "oure sib *," as they call it, is bad; they know the value of crossing, and they wish to cross, and do so; but it is without judgment. A farmer no sooner hears that his neighbour has got a good bull, most likely from a distance, than he says,

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* Nearly related.

"I must have a breed of him," as he calls the first offspring between his own cow and this bull; and the cow is put to this animal, although the one should be Galloway, and the other a Short-horn: thus his calves are so unlike, that, when his stock is carried to market, they present that tag-rag appearance which I have mentioned before, and which the best dealers are now rectifying to themselves for their own profit, by carefully classing them into horned or polled, &c. and thereby raising the value of the *self-same animal* from 10s. to 20s. a-head in the markets of the south, by giving them that uniformity which the breeder ought to have done.

When I would praise the advantage of crossing, I would have it then to be clearly understood, that it is only to bring together animals *not nearly related*, but always of the same breed; never attempting to breed from a race-horse and a cart-mare, or *vice versa.* Such a thing may do well enough for once to get an insulated animal, but will end in vexation, if attempted to be prolonged into a line.

We know that crossing, even however ill done, is productive of good. It uniformly frees an animal from many of the weaknesses and maladies to which those bred *in and in* are subject, and almost invariably procures a much larger animal than either of the parents. That enlightened gentleman and accurate observer of every thing connected with animals Sir John Sebright, whom I shall frequently have occasion to quote, says, "I have tried many experiments by breeding in and in, upon dogs, fowls, and pigeons; the dogs become, from strong spaniels, weak and diminutive lap dogs; the fowls become long in the legs, small in the body, and bad breeders."

Mr Bakewell, that illustrious breeder, denied this; and was the first, I believe, who said that a cross was unnecessary, that animals would not degenerate by being bred in and in, &c. but let us look to the result. His admirable breed of sheep are fast going to decay; they have even now become small, and are, to a great degree, what is termed soft sheep, *i. e.* liable to many complaints. The malady to which sheep are most subject, decay of the liver, attacks them very frequently, and, altogether, they make good the old adage, of soon ripe soon rotten; more quickly coming to maturity than any animal we know, and as speedily going to decay. I have seen the wonderful effects produced by crossing, in renovating this breed, having, for several years, been in the habit of buying in a couple of scores of Highland ewes, and putting them to a pure Bakewell ram. They were always poor small things, worth not more than from 3s. or 3s. 6d., to 6s. each; yet these ewes produced lambs which astonished every one who saw them, and which sold to the butcher at 10s. 6d. a head. As to the appearance of those lambs I shall have occasion to speak in another place. Did the limits of an essay permit, I could bring many more instances to prove this my first position, that it is absolutely necessary to shun breeding in and in; but, as I must hasten to the main question, I shall only remark, that the benefit of crossing extends even to the vegetable creation, a fact which is now pretty well known, and may easily be proved in the cultivation of various plants. In none is it more conspicuous than in the turnip. It is now some years since it occurred to Mr Gordon, farmer at Orrock near Aberdeen, that, as the brassica tribe easily breed together, as it were, it might be possible to cross the rutabaga with some of the other sorts. He did so, and found that the crosses which he had got were far superior in size to either of the sorts he put together, and also very hardy as to standing frost. I know another small farmer, who, after a very severe winter, tried putting red-top and Norfolk white together, turnips which are both very easily destroyed by frost. From these he procured a cross which stood the frost uncommonly well, and grew to a large size on poor soil.—But to proceed to selection.

In this term, I would include not only the choice of two well made parents, but the guarding carefully that the same defects, however slight, did not occur in both; for it is a fact, stated by Sir John Sebright, and which has uniformly been proved by my own experience, that it is not always by putting the best male to the best female, that the best produce will be obtained; for, should they both have a *tendency* to the same defect, although, in ever so slight a degree, it will, in general, preponderate so much in the produce as to render it of little value.

I found the truth of this in a very striking instance, about ten years ago. Having a cart mare of a very superior description, (and which has twice gained premiums at agricultural shows), I looked out for a first rate stallion, intending to breed from her. At that time a horse, belonging to Mr Buchan near Crieff, called Blaize, was carrying all before him *. I thought I could not do better than breed from this horse, not taking into consideration that both sire and dam were of the same make, viz. rather long in the leg; the consequence was, that I had a very fine foal, to be sure, but with longer legs than either of the parents. The next time, I had learned to correct my former error, and bred from a short legged horse from Cheshire, which was a great cross to my Scotch mare, and also differed from her in shape. The effect was immediately visible. I had a mare, which it would be difficult to produce an equal to, the leg not being so short as the father's, although the whole appearance much resembled him, nor quite so long as that of the dam. Another very striking instance of this came under my notice a few years ago. A friend of mine (General Burnett) had a mare what is called three parts bred, certainly a very fine mare to breed from, but a very tall mare with long legs, which was put to the longest legged thorough-bred horse I ever saw, (Bethlem Gober, the property of Lord Aboyne). The produce quite resembled the sire, and, at two years old, had reached the height of seventeen hands; but he was a monster, all legs, and very soon proved this, by knuckling over at the postern joint, till at last he could not walk; and at three years old was shot. The same mare was next covered by Hospitality, a horse as remarkable for being short in the leg, and what is termed short jointed. The produce was now a low sturdy animal, greatly resembling the sire, and short in the leg*; thus, in both instances, proving not only what I mention to be requisite, viz. judicious selection of the two parents in reference to the make of each, but also the great power of the male to change the whole shape and appearance of the produce.

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* This horse generally cleared £150 per annum to his owner, gaining every prize at all the agricultural shows for many years; frequently being selected as the best, when twenty-five to thirty of the finest stallions from Clydesdale and Fife were shewn in the same field; and was, without all doubt, a most superb horse.

I proceed next to mention the necessity of attending to *pedigree.*

If we look, with an attentive eye, to Nature and to her productions, we shall see that they are not only beautiful, but that all she does is uniform. Thus, every wild animal is of the same colour, and nearly of the same shape; every flower resembles another; but man must always be assisting nature, as he terms it. Then we see flowers grow many coloured, or perhaps double, beasts and birds change their shape, colour and nature, so that we see such varieties as were altogether unlooked for.

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* In the Philosophical Transactions for 1809, in a paper by Mr Knight on the same subject as this Essay, the author, in contending for the impropriety of propagating from large in preference to small females, brings forward a very interesting remark upon length of leg in the offspring. "Nature," says he, "has given to the offspring of many animals (those of the sheep, the cow, and the mare, afford familiar examples) the power, at an early age, to accompany their parents in flight; and the legs of such animals are nearly of the same length at the birth, as when they have attained their perfect growth." The natural result from which would be, that the offspring should resemble their mother in length of leg, and, consequently, while there was an excess in this respect on her part, care ought to be taken to breed from a male, calculated by the comparative shortness of his legs, or the great depth of his chest and shoulders, either to correct the tendency, or impart a body of proportional power.—Ed.

The only way we can guard against this, is to know well what the *ancestors* of the animals we breed from were. Without this, our produce will every now and then be breaking through the general rules, and annoying us with odd looking animals, deriving their shape from some of their ancestors, perhaps, two or three generations back.

Few words will suffice as to food, and care of the offspring. Nothing can be more absurd than to suppose that animals can improve, if neglected in their youth.

We have the strongest proof of this in the starved animals brought from the West Highlands, which crowd our fairs, particularly those of Falkirk and Hallow Fair of Edinburgh. Let a farmer buy some of those when "year olds," and place them (ere they be at the age of maturity) in a more genial climate, and on good keep. See what beautiful cattle they become. Let him buy two-year olds, and the improvement will be less,—at three, and they will only lay on fat, without reaching large size. On the other hand, let him purchase half a dozen starved looking small cows, from the same part of the country in calf (provided they shall be of the pure breed); let him take those cows home, and suffer the produce to suckle the dam while she feeds in good pasture. In winter, let them be well fed, and lie in a shed or house tolerably warm —What sort of beast has he now? Let the reader call to mind the West Highlanders shown at Queensberry House for the two last years, every one of which weighed from 70 to 80 stone, and the question is answered. I was once taken to see the cattle of the late General Simpson, who had the purest short-horn blood, a breed which, without all doubt, are capable of being made the fattest: These cattle were in such a state as I have never seen any other animals. They were all bone and skin, their eyes looked unhealthy; and altogether from starvation, and I rather think from want of crossing, they appeared like so many invalids in the last stage of consumption. To improve any breed, or keep it up when improved, stock must be well fed from the time they are produced. "Sir," said a great breeder to me once, "to produce a fine animal, you must feed him from the starting-post." Warmth, that is a temperate climate, appears to be perfectly necessary to the improvement of all animals, and particularly so *in live stock connected with agriculture*; for, if we look at these animals, or even the human species, whether in the frigid or in the torrid zone, we find them dwindling into Lilliputian size.

I come now to the grand point; to prove which, I conceive it will be necessary to fix upon some marks whereby a change, and that change an improvement, may be traced. The one, which in my mind is by far the strongest, is colour; next, I would place smallness of the head and ears; in the horse, ox, and sheep, prominence of the eye; in all, wideness of the chest, tendency to fatten, early maturity, tranquillity, and love to man, or rather dependence on man.

Let us now proceed regularly, and commence with the horse, as the most noble as well as the most useful animal. The influence that the male has on this class of animals is the most striking. Every one must recollect how, in blood-horses, the colour of the sire goes throughout the progeny, and, in a dealer's stable, every grey is a Delphini or Sir Harry Dimsdale, every black a Sorcerer or a Thunderbolt, and so on. While you hear people constantly remark that such a horse can be nothing but a get of such a one,—what is this but to say, the colour and appearance of the male goes throughout the produce? In work-horses it is the same. A very strong instance of this was visible some years ago in the county of Kincardine. Here there was not, I suppose, one single mare to be found of a chesnut colour, when Mr Barclay of Ury brought down a Suffolk punch, of a bright red chesnut colour, and in a few years plenty of chesnuts were to be found. A few years afterwards, a dun or slate coloured stallion gained the prize from the Kincardine Agricultural Association; when he came into the country, dun horses were very rare, now they are to be found everywhere. In the county of Fife, some years ago, a horse called Sportsman, found his way from Yorkshire, and covered a vast number of mares, particularly those belonging to the farmers, which at that time were either black or grey. This horse was a rich dark brown, with a tanned muzzle, and he instantly made a very large proportion of horses of that favourite colour; and what is still more remarkable, he was himself one of the best trotters ever seen, and his progeny were so also, so that the farmers talking of a good trotter, would say, "O yes, he is a Sportsman." Sir Robert Dick, a few years ago, purchased a work-mare, which I happened to know the breed of for several generations. She was black, very large, and coarse; eyes small, head and ears large, and very rough at the heels. This mare was put to Caleb Quotem, a beautiful bay horse, with much of what dealers call gaiety. I saw the produce, it was bright bay, with no hair at the heels; the eyes large, the head and ears small, and altogether the produce had put on the appearance of a blood-horse: here the dam was of the cart breed. Let us look the other way:—Mr George Harley Drummond had two or three thorough-bred mares, which had thrown foals, small in size, and deficient in bone, to a blood-horse. He put them to a cart-horse, they instantly produced stout boned colts, with much hair at heel, and altogether like the sire. In the year 1821, I purchased a very neat small mare for a relation of mine, which had a foal at her foot, by a cart-horse; this foal turned out to all intents a very good cart-horse. The mare was afterwards put for three seasons to Kutuzof, and the foals were in all appearance like blood-horses.

The late General Ayton of Inchdairnie, a great many years ago, sent down a horse from England to his property in Fife, which covered the country mares in his vicinity (at that time, I am informed, very poor beasts), and produced such wonderful effects on the breed in that neighbourhood, as may be seen this very day; the horses in that quarter being the best in the country, and particularly remarkable for width of chest, docility in work, and altogether fine animals. Last year (1824), I chanced to see the tenantry of a gentleman, who has the district which lies along the banks of the river Avon in Aberdeenshire, driving his winter store of coals. The horses struck me as being far above the common run of those in the Highland glens, and, in fact, first rate, compared with what ten years before I had seen in the carts of the self same farmers. I was at first somewhat at a loss to find out how so great a change had taken place, as I knew that the land in that part of the county was all held by small farmers, who neither could nor would purchase large high priced mares to breed from, far less those horses then in my view. I soon found, on investigating the matter, that the whole change had been brought about by good stallions; and in this way—The different agricultural associations in the North have, for many years, been in the practice of offering large premiums for stallions, which brought troops of fine horses from the west of Scotland. After the best had been picked out for the prize, the rest were set adrift; and these horses, dispersed over the country, of late years, from the badness of the times, and an overstock of them, covered at any price the farmer pleased to offer. Thus, good horses wandered into their glen, to their very doors, and at such a price as these men could give; the result was what I have stated.

In the horse, then, it seems clear that it is to the *male* we must look for improvement. Not that I would be supposed to assert that the whole improvement can be brought about *at once* by the male; that, if a man were to put a Shetland pony to Eclipse—such a one, for example, as "The Great

Unknown" has been pleased to mount Mr Yellowlees on—were the little beast, from which the agriculturist's legs dangled, put, I say, to Eclipse, no one would hope to procure a racer; nor can we think that a Lincolnshire black, and a Highland garron, taken out of a peat cart, will produce an animal fit for a London dray; but by repetition the end will be produced. I once put the question of the Highland Society to a very able man who fills a chair in one of our Universities, and who is an observer of nature of no ordinary cast, and who also, from his profession (a medical man), may be supposed to be a good judge. His answer instantly was, " The male, without all doubt, but, (added he), you must have a female capable of developing the good properties of the male, otherwise a good male will be thrown away."

I would next look a little at the influence the male has in the *ox*. Here, although I still see the male have by far the greatest influence, I would say that there was a shade of difference, perhaps 5 per cent. less than in the horse. The cow appears to be an animal whose progeny is often much affected by her imagination during the time of conception, or rather during the period when she is in season. We have the most ancient as well as the highest authority for this, in the peeled rods of Jacob; and from what my own experience, as well as the information of trustworthy men, has taught me, I am inclined to think that the calf very often takes after the beast that has been jumping on the cow (whether ox or cow) previous to her being taken to the male. One of the most intelligent breeders I have ever met with in Scotland, Mr Mustard *, an extensive farmer on Sir James Carnegie's estate in Angus, told me a singular fact with regard to what I have now stated. One of his cows chanced to come into season while pasturing on a field which was bounded by that of one of his neighbours; out of which field an ox jumped, and went with the cow, until she was brought home to the bull. The ox was white, with black spots, and horned. Mr Mustard had not a horned beast in his possession, nor one with any white on it. Nevertheless, the produce of the following spring was a black and white calf, with horns. I have twice had pure Ayrshire cows, which are uniformly what is called red and white, with horns. The first of those I put to a brown bull without horns; the produce was very dark red, without any white, and polled. The next cow was put to a jet black bull with horns; the first produce was dark red, without any white, and the next was jet black, and also without any white; and in both cases the make of the progeny took greatly after the sire. On settling in the north of Scotland as a farmer, I soon perceived that one of the greatest defects in the cattle was a tendency to be knock-kneed behind, and, in my endeavours to get rid of this, I procured a bull from the south of Scotland, free from that defect, and with him crossed the best looking cows of the country. I instantly got rid of that narrowness behind, observable in all cattle where no attention has been paid to the breed; and, in a few years, by drafting such queys as did not please me, and breeding only from good shaped ones, I made a breed for myself, which I had done before I knew it; for, having one season lost almost all my own calves, I was, in consequence of this misfortune, forced to buy in calves. These were treated in the same way as to food, &c. as my own, yet those from my own cows soon shot far ahead of them, both in size and condition; and, on examination of the two sets of animals, an evident superiority of form existed in those of my own, especially in the smallness and beauty of the head, with a prominent eye; and, a fact not hitherto mentioned, that of the tail being one-half less as to thickness than in the unimproved breed, while the wide chest (that unerring sign of a good and quick feeder) was very conspicuous *. It would seem that

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* This gentleman's stock are all jet black and polled, and so remarkably alike, that they shew much care in attending to the breed.

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* "An observation which Dr Jenner made to me about ten years ago,

horns had been given to the cow by Nature, and that the polled breed have been procured by selection of some of those varieties we so often see, as I observe that it more frequently occurs, when a polled bull is put to a horned cow, that the produce resembles the mother in that particular, than when a horned bull is put to a polled cow, when horns are almost always the consequence *. A great many years ago, the father of the present Sir Alexander Ramsay of Fasque brought a few of the Lancashire cattle to Scotland, a breed then much in fashion, and, as every one knows, remarkable for having uncommonly wide spreading horns, and all with some white, especially on the back. These cattle were intermixed with the cows of the country; and, when Sir Alexander came to his estate, the cattle were all horned. About that time the polled or dodded cattle came greatly into vogue in Angus; and Sir Alexander purchased, from time to time, jet black polled bulls, so that, in a short time, all his cows were of this sort. Nevertheless, every year, even to this day, one or two of the calves "cry back" to the Lancashire, having white, and horns; and, what is singular, it is almost invariably in the male that this takes place.

An instance of the influence of the male in the progeny of the cow is narrated by Bewick, the natural historian. He is treating of the original breed of wild cattle which still exist in a few parks belonging to noblemen in the north of England, and in one or two places in Scotland. They are uniformly pure white, with black, or sometimes red ears and noses, and always extremely wild and fierce. At Chillingham Castle in

(the truth of which has since been confirmed by my own experience, that no animal, whose chest was narrow, could easily be made fat), applies particularly to the Merino sheep, which are in general contracted in that part, and is well worth the attention of those who wish to improve this breed."—*Sir J. Sebright.*

* An old French writer on agricultural subjects imagines that polled cattle are degenerated. He says, "Meme en Ecosse on trouve la race très petite, et fort souvent sans cornes."

Northumberland, says Bewick, cows used frequently to be turned into the park when in season, which were covered by the wild bull; and, what is strange, the produce from all those cows were uniformly white, with red ears and noses, and greatly partook of the character and qualities of the wild bull. Here, then, is a very strong proof of the influence of the male parent, and others equally strong could be quoted, did I not think it better to pass on to another animal, the *sheep.*

Here the influence of the male parent is most striking. I have stated in a former part of this Essay, that I have been in the habit of purchasing a couple of scores of Highland ewes every year, to put to the Bakewell ram. Let us look a little at the characteristics of every breed in a wild, or at least nearly wild state. We find them muscular, active, restless in quest of food, ever in motion, and refusing to lay on fat *. Such I found the Highland ewes; they were all small, with black legs and faces, and had horns. On being put to the Bakewell, they produce lambs of a totally different breed from themselves, all having the greatest tendency to get fat, the wild wiry appearance of the Highlander being entirely gone; and in its place we have a round fleshy animal, resting peaceably in the fields, the desire to break over the fences having likewise disappeared; and what is remarkable, not a single lamb is to be found with black legs or a black face, and scarcely one with any sort of horn †, while all are of a very large size. They thrive remarkably well, any that I have allowed to grow up as an experiment; and I have always found them much more free from disease than either the Bakewell or the black faced sheep, particularly the rot of the liver, which makes dreadful havoc amongst the Bakewell; nor does it spare the Highlander, especially when put on high keep. I cannot speak much of the appearance produced by a Highland ram with the Bakewell ewe. Being fully convinced of the power of the male on the offspring, I have always accounted it as loss to put a bad male to a high bred female, and have never done so. I have, however, observed, where the country people have purchased high bred sheep at any sale of mine, and bred from them with the ordinary rams, that the breed very quickly got bad; whereas when a Bakewell ram had been purchased, I have seen a most remarkable change on the quality of the sheep; and in several instances where the ewes had been tolerable from which they had bred, the cross was so nearly resembling a new Leicester, as to deceive any one who was not a thorough judge. As I wish to confine myself to facts which have come under my own observation, I shall forbear to mention circumstances which tend to prove the great power in the male as to influence in the progeny of the ewe, as I have them from others; and shall conclude with the *sow.*

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* Look at the hare and the goat, however well fed, they refuse to lay on fat.

† Some few have a sort of shrivelled horn, which drops off, or more commonly they rub them off in the autumn.

The influence of the male in this animal is as great as in the sheep. A few facts will shew this. A friend of mine, soon after I commenced farming (thinking no doubt to do me a great kindness) made me a present of a sow of the wild species, in pig to a boar of the same sort. She was sent to me by sea, and during the voyage she broke out of the crib into which she had been put; and when the crew attempted to replace her, she attacked them with open mouth, and forced them to take shelter in the rigging. I put her into a high walled field, where she shewed every mark of a wild animal, starting off at the least noise, and running very swiftly to some concealment. When the time of littering came near, she set to work, and carried in her mouth great quantities of withered grass and rushes, till she had a heap the size of an ordinary hay cock. Here she had ten young ones, so concealed that no trace of them could be seen. When the heap was approached, she made a noise something like the bark of a dog, and ran furiously to attack the person who had the temerity to invade her abode. In a short time the young ones made their appearance; they were all perfectly alike, being of a red or dark-yellow colour, with regular black stripes, like a tiger or zebra, down the sides. As they grew old, they became darker, till they resembled the sow, which was of a port-wine colour. When it became necessary to take them, the mother was secured by a noose thrown over her, and the young ones were hunted down by a number of men. When escape was impossible, they gave battle, and offered to bite very furiously.

I now put the old one into confinement, where she had a second litter to one of the pigs, which were in all points like the first. I next put her to a boar of the Duke of Bedford's improved breed. At once the litter had a totally different appearance; the pigs were all different from each other; some had a slight kind of stripe, some none, some were light, some dark. Those which had stripes when littered, lost them, and grew lighter in the colour as they grew up. The leg had become shorter, as had the snout. They soon inclined to come out of the inside sty to the feeding trough, when the feeder put meat in it, and would feed while he stood by; and, lastly, they proved much better thrivers, getting very fat, which the old one, and all the former pigs, refused to do. I gave a neighbour a boar of the first litter, which he put to several of the Duke of Bedford's sows, where the change was equally manifest; the zebra stripe, the long snout, and the length of leg appearing in the whole of the young ones. I was now very sick of the sight of them, and sold them all off.

My stock now consisted of a cross between the Duke of Bedford's and Squire Western's improved Essex, and were as fine as any I ever saw, being as remarkable for tameness and good nature as the sort I have been speaking of were for the contrary. After breeding from these for some years, they at last got such a tendency to get fat, that they were entirely lard, and almost useless, from being too fat. Pork at this time had declined so much in the market, and the prices were so far from remunerating ones, that I parted with my whole stock but one sow at what they would fetch, thinking the first loss the best. From this sow I had two litters (previous to reducing my stock) by the full bred boar. They were like herself, short in the snout, had very small ears, hardly any legs, and were so tame that they would eat a few oats out of the man's hand who fed them. Having now no boar of my own, I had to look out for one; and being informed that a gentleman and neighbour of mine had a pretty good one, I sent a man and cart to beg the loan of him. I chanced to be in my yard when the man returned. My surprise was great when I found he had a beast muzzled and tied down with a quantity of ropes; and on his being turned into the sty, he proved to be a beast raving and foaming at the mouth, with long legs, a long snout, ears twice the size of the sow, and a long shaggy coat covering lank sides. In short, it looked as if my man had got a hyena out of Mr Polito's caravan rather than a boar from my neighbour's farm-yard; and, when put together, they by no means answered to the words of the old song, "Oh! sure a pair were never seen so justly formed to meet by nature."

The offspring of this alliance was exactly what I expected; the cross had greatly increased the size, the pigs being longer than either of the parents, while much of the boar was to be discovered in them; the snout had considerably lengthened, as had the ears and legs. The whole of my breed were pure white, with hardly any hair on them. The pigs were some black, some spotted, and had a sufficient supply of bristles; and, above all, they were lively, active, wild things, refusing to come near their food, while any one stood by, and had lost much of the tendency to get fat.

I have thus produced facts of the influence of the male on the progeny in the horse, the cow, the sheep, and the sow, and in all I have endeavoured to shew to the Society, that, whether that parent be the high bred one or not,—whether to improve or deteriorate,—it is the *male* which has by far the greatest influence over the offspring. I would still quote one fact more, which has come under my own eye; it is in the common fowl. In the year 1810, I procured a breed of the Malay or Chittagong fowls, and those I crossed once or twice with cocks of the same breed, got from different quarters. In spring 1824, they had been bred from cocks reared at home for three or four years, and were then all dark coloured, without a white feather, having either black or yellow legs. Most of them resembled a partridge. At this time I learned there was in a farmer's possession a breed of fine Malays, which his brother (a surgeon on board an Indiaman) had brought home. I sent and purchased one. He was what cock fighters term " pied," or, in other words, had numerous white feathers all over his body, with white legs. From this cock there were bred, in summer 1824, about seventy-eight chicks, of which number seventy-three were either pied or had a great deal of white on them; and a great proportion of them had white legs. Nothing but the influence of the male parents could have done this, for the hens were all gallant hens, not a white feather was to be found amongst them; nor could it have been owing to their ancestors, for they had all pedigrees as long as Sir Watkin Williams Wynn.

Thus far I have stated facts which are known to myself and friends only; I would now mention some which are within the reach of all. Let us call to mind the offspring from the mare and the jackass. Is it not obvious to all the influence the male parent has on the mule? Colour, shape of head, ears, and whole body, constitution, even temper, are all derived from the male parent. I had an opportunity of observing the very same effects in the colt from a quagga and a mare, in the possession of the Earl of Morton at Dalmahoy. And his Lordship, I believe, observed that the same mare, afterwards covered by a horse, retained in the progeny a resemblance to the quagga [*], a fact of a most extraordinary nature [†]. I have been frequently told that a mule got by a horse, with the female ass, is a far superior animal, and retains the mane, with the ears much less, &c.; but this is a fact I never could get to the bottom of. I only know it is believed by the Spaniards [‡]. Nothing can be more striking than the power of the male in birds. It is well known that bird fanciers, as they are called, put a cock goldfinch to a hen canary, and in that way get a strong, beautiful mule-bird, having the greater part in plumage, song, and total appearance of the goldfinch, and shewing, to the most trivial observer, that the male had the greatest influence in the progeny. Every one knows that the hen of any bird will lay eggs although no male be permitted to come near her: and that those eggs are only wanting in the vital principle which the impregnation of the male conveys to them. Here, then, we see the female able to make an egg, with yolk and white, shell and every part, just as it ought to be, so that we might, at the first glance, suppose that here, at all events, the female has the greatest influence. But see the change which the male produces. Put a Bantam cock to a large-sized hen, and she will instantly lay a small egg; the chick will be short in the leg, have feathers to the foot, and put on the appearance of the cock: so that it is a frequent complaint where Bantams are kept, that they make the hens lay small eggs, and spoil the breed. Reverse the case; put a large dunghil cock to Bantam hens, and instantly they will lay larger eggs, and the chicks will be good-sized birds, and the Bantam will have nearly disappeared. Here, then, are a number of facts known to every one, or at least open to be known by every one, clearly proving the influence of the male in some animals; and as I hold it to be an axiom that nature never acts by contraries—never outrages the law clearly fixed in one species, by adopting the opposite course in another,—therefore, as in the case of an equilateral triangle on the length of one side being given, we can with certainty demonstrate that of the remaining; so, having found these laws to exist in one race of animals, we are entitled to assume that every species is subjected to the selfsame rules,—the whole bearing, in fact, the same relation to each other as the radii of a circle.

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[*] The quagga is the species which links the zebra and the ass.

[†] An account of the circumstance alluded to by the author is given by the late Lord Morton, in the Phil. Trans. for 1821, p. 21.—(EDIT.)

[‡] If a mule be remarked in Spain as particularly neat and handsome, the muleteer will always say, "Si, signor, caballo estavo padre:" Yes, sir, a horse was his father.

Now, then, to the point of expediency. Let us suppose that I have formed an erroneous opinion, and that other essayists bring forward counter proof, to shew the power of the female. What difficulties arise in changing the whole females on an extensive farm, while with what ease a new male is procured! Sir John Sebright says, "Many females throw progeny unlike themselves, and it would be wise to try them with a male whose stock is known previous to breeding from them." How should we manage if we found it necessary from this cause to put away a set of females, which we had procured from a great distance, for the very purpose of improving our breed? If proof were required in a thing so plain to common sense, the enormous prices given for males in comparison of females, would shew the advantage of getting that sex which can give the breeder a hundred of his offspring in a season in place of one. Another advantage is the letting out the males to hire for the season, a thing greatly to be wished the Society would encourage, and give premiums for. This system is productive of the best consequences, a few of which it may be well to bring before the Society; and be it remembered that it is only by the male, for a thousand obvious reasons, that it can be done. When a person has bred or purchased a male, he not only does not like to put him away, although he perhaps has found out that he is not well calculated, either as to cross or selection, to suit the females he has to put him to; but from the partiality which we all have for our own, it is ten to one but we think an animal, which, in truth, is of no value, to be a very fine one; and thus the breeder patters on with an inferior animal, instead of year by year selecting such a male for hire as he sees would be best suited to correct the faults of his stock. Look to the good arising in our breed of horses from this system, which in fact public stallions exemplify. Look how the districts in England, where the practice of letting bulls and rams by the season exists, have far outstripped the rest of the island in the excellence of the stock which they possess; and let any one say if the benefit resulting from it is not self-evident. If such a thing were to be introduced in Scotland, and I shall hope one day to see it introduced under the patronage of the Highland Society, it ought decidedly to be in the shape of shows or competitions. Then a spirited farmer, or a few neighbours, could join and procure a fine animal at an easy rate: then the ignorant pretending judge would be told the truth by the verdict passed on his property by the public, who would not spare either his veracity or self-conceit; comparison would teach all a better taste and judgment; fine animals would be brought from England, and all quarters of the country; and rewards not only of fame, but of emolument, would be conferred on the man who paid the greatest attention to his trade, and consequently brought forward the finest animals. I do not think I can better conclude than by quoting the words of Sir John Sebright, whose ideas on the subject altogether coincide with my own. "There is perhaps," says he, "no means by which the breed of animals can be so rapidly and so effectually improved, as by its being the particular business of some breeders to provide MALE *animals* for the purpose of letting to hire. No trouble or expence will be spared by those who expect to derive profit, not from the quantity but from the quality of the animals which they breed; the competition which must always exist between breeders of this description will be a never-failing stimulus to exertion. The common farmer, who seldom sees any stock but his own or that of his neighbours, generally concludes that his own have arrived at the summit of perfection. But the breeder, who lets for hire, must frequently submit his male animals to the inspection of the public, and to the criticism of his rivals, who will certainly not encourage any prejudices he may entertain of their superiority. Thus each, besides the improvement of his stock, will receive a fair remuneration; and every breeder have the means of selecting the male he thinks best calculated for the females he may happen to possess."

I have now, I humbly conceive, shewn not only that it is the male parent which is capable of most speedily improving the breed of live stock connected with agriculture, but that *the male is the parent*, from motives of sense and sound polity, which we can alone look to for the improvement of our breed of live stock.

17*th August* 1825.

ESSAY II.—*By the* Reverend HENRY BERRY, *Acton Beauchamp, Worcestershire.*

Nolet hæc sub luce videri.

As this essay has already, in consequence of leave granted by the Society, been brought before the public *, we shall confine ourselves to a very short notice of it.

The author, after stating that the question proposed is one abounding in difficulty, and that the discovery of an independent quality such as that alluded to, in either sex, would be attended with beneficial results, proceeds to shew, that it is not to sex, but to high blood, or, in other words, to animals long and successfully selected, and bred with a view to particular qualifications, whether in the male or female parent, that the quality is to be ascribed, which the Highland Society has been desirous to assign correctly.

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* This very valuable essay is published at length in the British Farmer's Magazine, Part 1st.

The origin of the prevalent opinion which assigns this power principally to the male, is explained by giving the probable history of the first efforts in improving stock. The greatest attention would be paid to the male, both on account of his more extended services, and the more numerous produce of which he could become the parent, in consequence of which sires would be well bred before dams. " The ideas entertained respecting the useful qualities of an animal would be very similar, and lead to the adoption of a general standard of excellence, towards which it would be required that each male should approximate; and thus there would exist among what may be termed fashionable sires, a corresponding form and character different from, and superior to, those of the general stock of the country. This form and character would, in most instances, have been acquired by *perseverance in breeding from animals which possessed the important or fancied requisites*, and might therefore be said to be almost *confirmed* in such individuals. Under these circumstances, striking results would doubtless follow the introduction of these sires to a common stock; results which would lead superficial observers to remark, that individual sires possessed properties as *males*, which in fact were only assignable to them as *improved* animals."

The opinion entertained by some, that the female possesses that power generally ascribed to the male, is also explained by a reference to the history of breeding. " It is well known to persons conversant with the subject of improved breeding, that of late years numerous sales have taken place of the entire stocks of celebrated breeders of sires, and thus, the females, valuable for such a purpose, have passed into a great number of hands." " Such persons (in consequence of reasons given by the author) have introduced a cow so acquired to a bull inferior in point of descent and general good qualities, and the offspring is known, in many instances, to have proved superior to the sire, by virtue of the dam's excellence, and to have caused a suspicion in the minds of persons not habituated to compare causes with effects, that certain females also possess the property in question."

The author then gives several instances illustrative of his views. In most of these the male was alone the high bred animal, to which circumstance, and not to his sex, the author ascribes the remarkable likeness which the offspring usually bore to the sire; for, when a male and female are equally well bred, and of nearly equal individual excellence, it is stated as not probable that their produce will elicit any general proof of a preponderating power in either parent, to impress peculiar characteristics upon the offspring."

The following unequivocal cases are brought forward relating to the pig. "The writer has been for some years in possession of an improved breed of pigs, which are chiefly of a sandy or brown colour. His sows of this breed, crossed with common boars, almost invariably produce litters of pigs of their own colour. At the present moment, he has a litter of eleven pigs from a brown sow of the improved breed, by a black and white boar of the common breed. The young pigs possess all the characteristics of the dam, and are of precisely the same colour. In litters of pigs got by the improved boars from country sows, the colour of the improved race also predominates in a similar manner.

"The writer's brother was lately in possession of well bred pigs, the most striking characteristic of which was a short pricked ear. The produce of these, with the large pendent-eared swine of North Wales, was invariably similar in the ear to the higher bred animal, whether male or female."

The author follows up his principal argument, (of which only a very imperfect idea can be formed from the notice now given) by other illustrations, which do not easily admit of abridgment, and thus concludes: "If what has been advanced shall appear to be founded in reason, it is submitted, that, with our present scanty stock of information on this difficult question, one only rational course can be adopted by breeders, viz. that of *resorting to the best male*, a simple and efficacious mode of improving such stocks as require improvement, and the only proceeding by which stock already good can be preserved in excellence."

ESSAY III.—*By* MR CHRISTIAN, *Mill of Forest, near Stonehaven.*

Tot homines quot sententiæ.

THE author has treated the subject chiefly in a critical and physiological manner, and supports the view, that the offspring bears the greatest resemblance to that parent, whether male or female, which has exerted the greatest sway of generative influence in the formation of the fœtus *, "that any hypothesis which would assign a superiority, or set limits to the influence of either sex in the product of generation, is unsound and inadmissible;" and he thus concludes, "As, therefore, it is unsafe to trust to the qualities of any individual animal, male or female, in improving stock, the best bred and most perfect animals of both sexes should be selected and employed in propagation; there being, in short, no other certain or equally efficacious means of establishing or preserving an eligible breed."

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* Although the offspring should often bear a close resemblance to the male parent, it does not necessarily follow that he has contributed a part of the substance of which the fœtus is formed. Such an inference, however natural, must yield to what appears to be the fact universally,—that the female alone produces the ovum, the function of the male being only to impregnate, that is, to alter in such a way as that they shall be developed, having the characters of the offspring of both parents, one or more ova previously existing. In some animals the ova are impregnated after exclusion from the female, and, in plants, where we observe the influence of the male in impressing the offspring very conspicuously, the pollen is often deposited at a considerable distance from the seed-vessel, and, in such circumstances, as to render the conveyance even of the minutest portion there in the highest degree improbable.—(EDIT.)

Essay IV.—*By* (*the late*) Mr H. N. Dallas, *Edinburgh.*

Fortes creantur fortibus.

In this essay, the writer, under the idea that the fluid of the male invests the ovum, the formation of which he ascribes to the female, supports the opinion, that where external appearance is concerned, the influence of the male will be discovered; but in what relates to internal qualities, the offspring will take most from the female. He thus concludes: "When colour, quality of fleece, or outward form, is wanted, the male may be most depended on for these; but when milk is the object, when disposition, hardiness, and freedom from diseases of the viscera, and, in short, all internal qualities that may be desired, then the female may be most relied on."

ESSAYS ON THE CAUSES, PREVENTION, AND CURE, OF THE DISEASE IN SHEEP CALLED THE BRAXY.

[The diseases of the sheep, by which it is estimated that from five to ten per cent. are annually cut off, have, oftener than once, been made the subject of prize-essays by the Society. In 1803, a great mass of information was received on this subject, chiefly from Border shepherds, whose information and mental habits are very far beyond what we naturally associate with the name of their profession. The essays then received were submitted to one of the medical Professors * in the University, eminent for his attainments in nosology, and by him condensed into one treatise on the Diseases of Sheep, which is published in the third volume of the Society's Transactions. Since then, many works on the same subject have been published; but the opinions expressed were still so various, and the practical benefits that had resulted so small, compared with those which might be expected, were the subject thoroughly understood, that the Society again, in 1824, advertised the disease called Braxy alone, as a subject for essays. Premiums were awarded to three of those which were received. One of these is by Mr ROBERT LAIDLAW, Edinburgh; who, in 1780, by departing from the practice then universally prevalent in the Border store-farms (of hirselling the hogs, during the latter end of summer, on the stinted pasture of the Sumner Hill, and then letting them down upon rich pasture), and by giving them nourishing grass all the season, states, that he diminished his loss by braxy one-half. Another is by Mr S. FRASER, Muirhead, by Inverness, who was the first to introduce the Cheviot breed into that county. The third is now published, with a few omissions, as it was received from the author.—EDIT.]

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* Dr Duncan *junior*, Prof. Mat. Med.

Essay on the Disease in Sheep, called the Sickness or Braxy *. By Mr WILLIAM HOGG, Shepherd, Atterstane, Parish of Stobs, Peeblesshire, 1824.

IN order to preserve distinctness and perspicuity in the following essay, both to facilitate the writing of it on the part of the author, and the understanding of it on the reader's part, it has been thought necessary to observe the following method:—

I. To explain the course of the aliment through the intestines of a sheep, and, in doing this, to notice some of the principal changes it undergoes in passing through that animal.

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* The following observations on *sickness*, or *braxy*, are confined to that disease, as it affects sheep grazing hill-pasture. The author never had the opportunity of attending minutely to the course of the disorder as it sometimes prevails among hogs feeding on turnips. At least, his knowledge of it in this case has been so limited, that he cannot write decisively on it.

II. To define what the BRAXY or SICKNESS is, which will lead to a description of the appearances exhibited by the affected organs upon dissection of the carcass.

III. To point out the causes of the sickness: and,

IV. To suggest some methods for its prevention.

The first thing to be done, then, is to explain the course of the aliment through the intestines, and, as far as is necessary for understanding the essay, to point out some of the principal mutations which it undergoes as it proceeds through the different parts of the animal.

To a careless observer of a sheep as it feeds, it appears that the act of swallowing food is performed regularly as it is gathered. This is not the case, however. Even when the bite is abundant and plentiful, it requires several essays of the foreteeth before a sufficient quantity can be collected for the action of the jaws. In its first revolution among the jaw-teeth, the grass is partially crushed, and sent down the meat-pipe into the left side of the stomach, which is called the Paunch Here the half-chewed substance is stored up in the same order in which it was swallowed, that is, in small tufts or bunches, but plentifully impregnated with its own juices, which the animal squeezed out of the capillary vessels of the plant when it was subjected to the operation of the jaw-teeth: there is also infused into it, as it passes through the mouth, an exudation from the salivary ducts, which has in the stomach a soapy appearance. When the animal feels itself pretty full, it lies down and ruminates.

The return of the cud to the jaws is caused by the joint agency of the stomach and œsophagus, whose power to transmit it back to the mouth for complete mastication, is as effectual as to swallow it at first. In this second revolution through the mouth, the fibry parts of the food are more fully broken, and all the juices of the grass completely diffused through the chewed mass: a plentiful discharge of saliva into the food is also necessary to promote its circulation through the other departments of the stomach. It is now sent into the second * division, denominated the King's-hood; the inner coats of which are indented with small pits, like the meshes of a net, and hence its scientific name Reticulus. Here it first commences its motion downward; but whether any farther communication be made to it or not, as it passes this department, would require to be determined by a course of experiments more minute than the writer of the present essay has ever had it in his power to make. The principal benefit it here receives seems to be derived from its motion downward and among its parts, for there is here a sensible motion of all the particles of food, accompanied by a small oozing sound, which may be heard in a newly killed sheep, when its stomach is immediately opened. This, no doubt, farther concocts and prepares the food for its subsequent distribution through the system. In this second division, and in the third, into which it afterwards enters, the aliment is comprehended in far less space than in the first; whence it is much warmer, and its contents more pulpy and soft. The third division is denominated Monoplies, from its internal structure consisting of innumerable folds or doublings,

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* As the sheep differs remarkably from most other ruminating animals in scarcely requiring any water, we should not be surprized at some peculiarity in the process of ruminating. But in those cases which have been most accurately examined, it has been ascertained that the food, from the first stomach, is transferred in small quantities to the second, from which it is returned in pellets to the mouth to be masticated, and then swallowed immediately into the third. In the camel, indeed, the first stomach performs the function here ascribed to it by the author; but in that animal the second is exclusively a reservoir for water, and its digestive apparatus differs in other respects. We would recommend to the ingenious author to revise this statement, which is also made by Sir George Mackenzie in his Treatise on the Diseases, &c. of Sheep.—(Ed.)

through which the food leisurely passes. As it works its way through these folds, it is farther triturated. It then enters the last department, the Reed; which name it probably derives from its inner coats and loose folds being of a red or bloody colour. This is the proper stomach of the animal, and in it the food undergoes the greatest change. Here it is mixed with the gastric juice, which melts down every alimentary particle, and finally prepares it for entering the Small Guts. This division of the stomach is smaller than any of the rest, of an oblong shape, and, at its lower end or point, it transmits the aliment through a very narrow passage into the small guts. This aperture, which is called the *pylorus*, is wider in some sheep than in others of the same age and size; but, in general, even in a full-grown sheep, it will scarcely admit the top of the little finger. Through this orifice the meat leisurely enters the small guts. It is now a fine thin pulp, being entirely reduced by the solvent juices of the last department of the stomach, and nothing solid remaining but the excrementitious parts of the food: this slides along with the true aliment in a broken rooty state, but none of its parts exceeding one-eighth or one-tenth of an inch in length; these parts are also of very slender thickness. When the food exudes through the *pylorus*, it enters the *duodenum*, which widens to three-fourths of an inch, or more, to receive it. But as the course of the food has now been traced beyond that part of the viscera where the disorder, of which it is the object of this essay to elucidate the nature, has its rise, it is unnecessary to describe minutely its course farther. It may be shortly noticed, that, about a finger's length from the *pylorus*, it is joined by a green saponaceous liquor from the *gall-bladder*; after which it circulates the wonderful length of about eighty feet through the intestines—and all this while the absorbents present their mouths, and take in the pure alimentary part of the food as it passes. This, in a newly killed sheep that has been healthy, is visible to the naked eye, and is of a white milky colour. By the time the aliment reaches the *blind-gut*, the nourishing particles are completely extracted. Its motion then becomes more sluggish, and, before its final extrusion at the anus, it has acquired some putrescency, nothing being ejected but the rooty or fibry parts of the plants, which had resisted the digestive and dissolvent powers of the stomach.

The course of the aliment through the different viscera of the animal having now been described, as far as is necessary for the understanding of this essay, the definition of what the *Sickness* or *Braxy* is, is next to be proceeded in: this will naturally lead to a description of the appearances exhibited upon opening a sheep which has died of this disorder.

The *sickness* is positively an *inflammation of that department of the stomach denominated the Reed*, but the various appearances observable upon opening the dead animal have led to different definitions of the disorder,—have occasioned different parts of the bowels to be assigned as the place of its commencement, and sometimes different theories to be brought forward as to its cause. The rapid or tardy progress of the disorder, however,—the position in which the animal has been lying previous to, or at, its death,—the length of time between its dying and its being opened,—all these, in a carcass rapidly mortifying, with several other considerations which might be adduced, do really, in different cases, and even in the same case, in a short time, and in no small degree, vary the appearance of the affected organs. The writer of this essay has dissected several hundreds that have died of *sickness*, has opened them in all its stages; and in the whole course of this his experience, there has not been above one case in a hundred where it was not evident that the *reed* was, or had been, the first and principal part affected.

The inflammation generally commences about the *pylorus*, and hastily spreads over all the folds and inner coats of the *reed*. The transmission of the aliment through the pylorus soon stops, and the heat and swelling of the reed and its contents rapidly increase. With the commencement of the inflammation a good deal of serum is engendered about the place, and the heat, doubtless, increases in a most rapid proportion; for, not unfrequently, that portion of the aliment which was in the *reed* at the beginning of the disease is parched and dried throughout, while the internal folds and external surface of that viscus are a shapeless mass of extravasated blood and serum.

As soon as the descent of the aliment is stopped at the pylorus, the head of the intestines becomes void, but inflated with air of a strong sulphurous smell. The next principal organ which exhibits marks of putrescency is the *liver*. When a sheep is standing or lying, in its natural position, the *liver* is in the immediate neighbourhood of the *reed*, or rather its lobes spread over it; hence, from the heat and inflammation, the *liver* speedily putrefies, and even before the animal dies of the disease, certain signs of putridity appear on this organ. The blood also soon loses its fluidity. The writer of this essay is not scientifically acquainted with such matters; but, if he were to hazard a conjecture, he would say, that the serous part of the blood separates from the *crassamentum*, leaving the last so thick that it will not flow from the veins, unless the orifice be very large; and even then only in drops. This appears to take a considerable time before the animal dies. The serum seems to be collected principally about where the inflammation begins, but is soon diffused among the intestines; and if the carcass lies any considerable time undissected, it pervades the whole system to such a degree, that the flesh is often found raised from the bones with it.

But it is impossible to describe every appearance exhibited, or the degrees of corruption that instantly take place on different subjects within the same time. The temperature of the weather, the circumstance of the animal's being smeared or white, the posture in which the animal dies, and the state or situation it lies in from its death till its dissection, as was said above, all vary the appearances on dissection, and that in endless proportions. This diversity of appearances has led some to conjecture, that the disorder begins in one part of the viscera; and others, that it begins in another. But, only a very few cases excepted, the reed is found always the first and principal seat of the disease. The reed, the blood, and the liver, appear to be the first parts affected. A vast accumulation of serum is soon collected in the *abdomen*, and immediately pervades the whole system, especially those parts of the carcass which lie on the ground. To such a degree does this sour pituitous matter swell the fleshy parts, that it is no uncommon thing to find the skin ruptured, and the serum welling out on the ground.

It will next come in course to be pointed out what, from his own observation, the author has known to be the immediate *causes* of this terrible disorder; but, previous to entering upon these, it will be necessary to state, that there is an unknown influence in some seasons more than others, which powerfully disposes to this disease.

This undefinable influence may be called the predisponent cause; it arises from the combined influence of the soil and the general temperature of the season. Hill-pasture, through all its departments, every year produces the same species of grass, but differently prepared and attempered by the peculiarities of each season which produces and matures it; and as the temperature of the season invigorates or neutralises the morbid tendencies of the pasture, this disease will more or less prevail. It has come under the observation of the author, that, on the same pasture, and under the same management, and the lambs of which the hirsel* was composed being lifted yearly from the same mothers, and, moreover, the number of the hirsel being in every year the same, viz. 700, it has come under his observation, that, in these circumstances, sometimes 100 hogs fall by this disorder, while, in other seasons, no more than 40. Now, to what can this difference of deaths be ascribed, but to some noxious quality in the pasture which the temperature of the season did, or did not, communicate or cherish? On this the animal is, as it were, bred up in a state fully prepared for the disease, and needs only an exciting cause to rouse it into action. This exciting cause is often very weak, such as continuing to feed too long upon a particular spot, or the being prevented by a tempestuous day, or other incidental cause, from getting the wonted range over the pasture. Any of these is sufficient to call it into existence.

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* *Hirsel* is a word purely pastoral, and signifies any number of sheep which one man takes the charge of.

But the reader will here probably put the inquiry, how can it be known that the *reed* is the first of the intestines that is affected, when the animal is not dissected till after its death? In some cases it may be dead some hours before it is found, nay, in many half a day, or even a whole day, may pass between its death and dissection; and, when the carcass is opened, how can it be determined what part of the viscera has been primarily seized? It may, in every department, exhibit marks of putridity; and often mortification may be so far advanced, as not to admit the gentlest touch, without the parts falling asunder. How, then, can it be so positively asserted that the *reed* is the first part affected?

The solution of these questions will do a good deal towards explaining the nature and rapidity of this disease. It is the preceding day's course of feeding which gives existence to it. The animals, it is apprehended, are generally attacked soon after retiring to their lairs, and they are found dead next morning. Yet, among a numerous hirsel, such as that instanced above, the shepherd, if he be attentive, will notice individual sheep seized with it at any hour of the day. When so noticed, they should be carried home, for two reasons; first, that the power of some medicine may be tried upon them; and, secondly, that they may be prevented from wandering away in an agony of pain into the bottom of some linn or gulf, to be there torn to pieces before they are discovered*. When the author of this essay had the opportunity of observing sheep newly infected with this disease, and found it still increasing, which it almost invariably did, (for, during eight years in which he had the charge of better than 700 hogs, only two or three lived that were attacked by the *sickness*, and one of these, he remembers, vomited very much as he was carrying it home on his shoulders), to render the flesh of the animal eatable and wholesome, he killed it, and hastened to inspect its entrails, and where and how they were affected. This gave him an opportunity of examining the disease in almost all its stages, and the *reed* was less or more, and always sorest affected.

But, to be more particular, the taking any substance into the stomach not truly alimentary, the author has found to be an exciting cause of this disease. The *sickness* begins to shew itself in the latter end of October, and continues its ravages till near the conclusion of January; but, if the hirsel, among which it has broken out, be still in tolerable habit, and the weather rough and stormy, it will probably be the beginning or middle of March before it begins to abate. Now, from the latter end of October till January or March, the creature has occasion to eat, and in some cases is necessitated to gather, along with its food, substances of indigestible qualities, which resist the solutive power of the stomach, and thereby cause an inflammation. But, to explain how hogs were, or are, subject to gather along with their food things of an unwholesome tendency, it will be necessary to explain their management for a while previous to the appearance of this disorder among them.

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* It may here be observed, that, on a pasture where the *sickness* yearly prevails, the raven and the fox make dreadful havoc among the dead carcasses, if the shepherd does not immediately find them. These wild animals lurk and breed in the neighbourhood till they are exceedingly numerous, and both by night and day traverse the pasture, in all directions, in search of food.

That species of stocking* most exposed to *sickness* is hogs, especially wedder hogs. After they are weaned, they are taken to what store masters and shepherds call the *Summer hill.* This is done for two reasons; first, to harden and confirm the constitution by feeding on the healthy coarse grasses; and, secondly, to preserve the more grassy and lower lying pasture for the time when the inclemency of the season obliges them to forsake such elevated and exposed tracts. This low lying sheep walk to which they afterwards withdraw, is denominated the *Hog Fence,* because it was defended from the encroachment of every other species of stocking while the hogs were at the *summer hill,* and strictly reserved for the hogs during winter. They generally enter upon the occupation of this *Fence* near the latter end of July. August and September are employed in gorging themselves to the full on this luxuriant sward, and they rapidly increase in flesh and fat. They are the more apt to indulge themselves to excess on this succulent herbage, as they had been restricted to the dry benty grasses during their stay on the *summer hill.* By the time October is half over, these nutritious juicy spots on the pasture are close eaten, yet still they resort in crowds to them. What of the sward is left unconsumed is paddled and fouled with impurities, such as moss, sand, clay, &c. which they have partly brought hither with their feet, and partly poached out of the soft surface; and if a few scores are allowed to indulge themselves all day on these deleterious places, and not directed, in the afternoon, to such pasture as is calculated to rectify the crudities they have gathered along with their meat, some of them are sure to be found dead of the *sickness* next morning.

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* *Stocking* is a general name for that quantity of sheep which a farm keeps, and, when limited to any department of a farm, it means that number of sheep which that separate division of the farm contains.

Whether the above account of the general management of hog-hirsels during the harvest quarter, and of the beginning of the *sickness* among them, will, in the first instance, meet the eye of a practical farmer the author knows not. The relation is entirely from his own observation, and he thinks there is no man that has been bred up in the rearing and management of sheep, but who will find the remarks true, and the conclusions just.

So much for the first part of the proposition, which was, that hogs *have occasion* to eat what the solvent power of the stomach cannot concoct into aliment; the other part of it, namely, that hogs are *necessitated* to gather, along with their food, substances which are indigestible, and which give existence to an inflammation, comes now to be illustrated.

The cause and the effect are the same in both cases, only in the last they are constrained, through mere hunger, to swallow the unwholesome ingredients. This occurs when a strict and severe storm of snow is on the ground. When a deep snow lies long on the ground, the hunger of the poor creature becomes excessive, and it catches at every thing which rises above the frozen surface, such as rotten sprat, rotten and half withered fern, rock-fog, &c.; and, in some situations, where it can get at the surface of the earth, it bares away not only the sward, but a good deal of clay and sand. Such unnatural and indigestible substances mixing and going into the stomach with the food, meet with no obstruction, nor probably give the animal any uneasiness, till they reach the last department of the stomach. There these crudities inflame the tender coats of the *reed*, the animal sickens rapidly beyond all conception, and, sometimes in the compass of an hour, dies*.

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* It is here said, that such austere and indigestible crudities, going down with the meat, irritate the tender coats of the stomach, and so bring on an inflammation; but, though it is certain that these inconcoctible materials going down with the food are the cause of the *sickness*, yet the

This last exciting cause, it may here be noticed, is by far the most powerful of any that ever came under the observation of the author. The deaths caused by pasturing too much on fouled ground out of the above instanced number of hogs, rarely exceeded three or four in a week; but when a storm of snow was on the ground, and the whole hirsel were restless with hunger, and ate at any thing which appeared above snow, the deaths were most frequent, and the disease most rapid in its course. It was then no uncommon thing to find six or seven dead all in one morning.

Another exciting cause of the *Sickness* is boisterous, changeable weather; that is, when the air changes rapidly from frosty to fresh, and again from fresh to frosty. It is evident that the state of the atmosphere *has* great power over animated bodies, especially such as are constantly exposed to its influence; but *how* the quick transitions from thaw to frost, and *vice versa*, operate, so as to induce to this disorder, cannot be so readily explained. Probably it is by instantly checking perspiration, or by intense cold seizing the belly of the animal as it lies on the wet ground. Nothing is more certain, than that, when a course of tempestuous changeable weather occurs, the sickness always appears on sickrife * pastures

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author could never be positive whether they operated by directly stopping the *pylorus*, and hindering the protrusion of the aliment through that small orifice, the inflammation of the *reed* being only a consequence of the *pylorus* being stopped. He rather, however, inclines to be of opinion, that the inflammation in the *reed* stops the descent of the food; for he has seen the *pylorus* open when the inflammation was begun both inside and outside of the *reed*. It is certain, on the other hand, that many of the half-chewed pieces of fern, sprat, &c. which the poor hungry creature hastily swallows, are of sufficient bulk to hinder the descent of food from the *reed*, for over them the stomach seems to have no influence. They are often found, both in the stomach and intestines, not in the least dissolved. One thing is certain, if the disease be rapid and powerful, the stoppage of the aliment and inflammation of the *reed* take place nearly at the same time.

* *Sickrife* is a pastoral word, and, applied to pasture, signifies that *sickness* is the prevailing distemper among the flocks.

But it must be remarked, that with this cause is also combined that of feeding too much on fouled pasture. This last, (changeable weather namely), from a train of circumstances which irreversibly follow each other, always acts in conjunction with the first, though the first operates, unassisted, by itself. The train of circumstances which unite their influence is this:—The rude tempestuous weather drives parcels of the flock into, and keeps them in, hollow sheltered spots. These are the places already over-eaten and foul; and, so long as the weather continues turbulent, these are still the only places where they can pick up a livelihood. With the wet weather, and the resort of such numbers to them, they become doubly fouled and bare. These two causes united, prove very destructive. The external symptoms, and the internal appearances when sheep die of *sickness*, excited by the joint operation of these causes, differ nothing from those observable when the disease has been induced by the first cause alone.*

Thus have been enumerated the exciting causes of this disease. The two first are homogeneous, only the animal gathers the unwholesome ingredients under different circumstances; the third seldom acts by itself, yet it is probable that it disposes to *sickness*. From a train of circumstances over which the shepherd can have no controul, it is never long till the first exciting cause comes in to its aid.

There is a fourth exciting cause, but its agency in producing this disorder, is more original than any yet mentioned, and a description of it will fall more naturally under the fourth division of this essay, which is, To suggest some methods for the prevention of the *sickness*. To this we now proceed.

Besides stating how the *sickness* may be in part prevented, it may be expected that the author should also point out some cure for it; but he has no hesitation in asserting, that, if the disease cannot be prevented, it never can be cured so as to be of any sensible advantage to the store-master, whose flocks wander in extensive pastures. His reasons for this assertion are the following:

1st, It is often the preceding day's feeding that is the immediate cause of this disease; and if the disease is raging to a great extent among the hirsel, its course is frequently circumscribed to a few hours. Nay, in some cases, a single hour, or an hour and a half, terminates the creature's existence *. Hence they die in the night-time, and are never seen till they are found dead.

2dly, When they are seized with it in the day-time, the pain is so acute and sharp, that it causes the poor creature to wander in agony from the rest, and hide itself among heath, fern, &c. or in the bottom of some ravine, where it is not found till the raven indicates, by her croaking, and by the wheels she makes in the air, whereabouts the carcass is.

3dly, The disease is fixed in so remote a part of the viscera, that the most powerful specific poured down the animal's throat, can have no access to the seat of the disease for a very long time; especially when we consider that, a little after the inflammation begins, the stomach's power of protruding the meat from one of its divisions to another ceases, and the aliment presses so densely and heavily on the reed, that no preparation, however active, can either penetrate or dissolve it. But suppose a cure should be effected, a fourth reason why the store-master will never derive any sensible advantage from it is, because it leaves the creature in so enfeebled and exhausted a state, that it must inevitably die of leanness in the spring, if not before winter be done. This is not said from any actual observation of cases where the disorder has been cured, for few such, indeed, are to be met with; but well it is known, that, when a sheep is reduced by disease or accident but a few degrees below the ordinary state of the flock, it is quite unable to struggle through winter, and an attack from the *sickness*, if it could be removed, would leave sheep in as debilitated a state as any disease to which they are liable.

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* When the deaths are numerous, the course of the disease is more rapid than when only a few of the flock are affected. When only one or two are dying in a week, it is no uncommon thing for them to be seized in the morning, to struggle on all day, and not die till the afternoon or night. These the shepherd may try with what medicine he pleases; it is generally to no purpose.

Any of these reasons singly is fully sufficient to prevent any benefit from cures or treatment of any kind. There is none of them fanciful or imaginary; the practical store-master will find them all real, and in most cases operating with greater energy and absoluteness than at a distance he thought they would. But we proceed to point out what has been found to be the best means for preventing loss by this disease

The proper subjects of this disorder are hogs: these are of two kinds,—ewe and wedder hogs. The former are raised to repair the breeding-stock; consequently are a species of stocking which cannot be wanted; the latter to be transferred to English pastures, when they are about fourteen months old; sometimes they are reared to replace older heads * of sheep of the same kind, which occupy some elevated department of a farm, on which ewes and lambs cannot be raised to advantage.

In the case of ewe-hogs, where they are bred only for the purpose of supplying the place of the old cast ewes or kroks †, instead of embodying them into a hirsel by themselves, as was the old custom, they are now put to graze at large among the ewes they are intended to recruit. This plan continues the native perceptions of the animal strong and uninjured, and this unimpaired state of its senses more clearly admonishes what is most healthy, both in the course of its feeding, and in the habits which it forms; and this proper regimen, which the animal naturally adopts, or rather falls in with, in conformity with the older and more experienced ages of sheep, is found, in a great measure, and on most situations, altogether to prevent the *sickness.* The question, then, How the *sickness* may be prevented among ewe-hogs? is thus set at rest; but how it may be prevented from attacking wedder-hogs is not so easily determined, especially when we consider that they are more vulnerable to its attacks than ewe-hogs are.

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* *Heads of sheep* sometimes signify sheep of different ages. Thus a hirsel, consisting of five ages, is said to consist of five *heads* of sheep. Sometimes the phrase means sheep of one kind, that is, all male or all female. It is used in the text in the latter sense.

† *Kroks*, *crooks*, or perhaps more properly *crones*, are ewes which, by their age, are unfit for breeding; but the term generally signifies sheep that, on account of their age, or other imperfection, are rejected and sold off a farm as improper to breed any longer from.

When wedder-hogs are raised for the English markets, and the pasture is, year after year, sickrife, they ought altogether to be laid aside, and the situation occupied by ewes and lambs. These will be found more profitable; no species of stocking pays better than ewes and lambs; and the place which is suited to winter hogs on, is sure to answer the latter kind of stocking fully as well. In many places of the Highlands, the farmer cannot find a market for his wedder lambs; hence he is under the necessity of keeping them till they are able to travel southward to English markets, and they cannot be disposed of before they are a twelvemonth old. Besides, in this country, there are many large tracts of sheep pasture, of which male sheep are the only and appropriate stock, and wedder-hogs must be reared to keep up that kind of sheep. In both these cases, the farmer is under the necessity of stocking some department of his farm with wedder-hogs. To suppress, then, this disorder as far as possible, let a range of pasture be chosen which abounds with mossy productions; not that such kind of herbage will absolutely prevent it, or immediately stop it when it is raging among a hirsel, on a sickrife pasture, and they have been transferred to it, which is sometimes necessary to be done; far less is it of such efficacy as to check the disorder itself, when it is roused into existence in an individual sheep; yet hogs that have been applied to a pastúre abounding with mossy productions, when they were taken from their mothers, and continued on it through winter, are never in any great degree subject to this disorder. This proceeds from two causes:—Mossy herbage is strong in the leaf, and coarse in the pile, not easily eaten bare, and continues clean and unfouled notwithstanding their frequent puddling about on it; hence they gather few or no impurities with it. But a more powerful cause is the influence of mossy pasture on the constitution itself; it disposes to disorders quite opposite to the inflammatory kind. It is dry arid pasture that gives the system a closeness, compactness, and heat, which strongly dispose to all inflammatory disorders, whether internally or externally.

Secondly, Easy-lying pasture is averse to the *sickness*, both from the peculiarity of its herbage, and the facility with which hogs pasture over all its surface. In alpine districts, flat easy sheep-walks are always tinctured with moss. The influence of this substance on the grasses, and of these on the animal pasturing them, has been noticed. Gently rising hills, of a moderate height, are also accessible to sheep almost through the whole year; they have access to herbage of every quality which these produce; and a browse, in the afternoon, on bent, moss, heath, ling, is peculiarly good for correcting the crudities which they may have gathered among their more juicy or tathy food through the day. To such places as abound with these healthy hardy grasses, the shepherd should leisurely and soberly conduct them in the afternoon. Although they eat but a small quantity from them, they assist in digesting the rest of their food; and, while employed in gathering them, they are prevented from loading their stomachs too much with the tathy impure sward of which they are very fond, and which is vastly conducive to the *sickness*.

But, in many districts, the qualities requisite in a pasture averse to the *sickness* are chiefly found in high and exposed tracts of land, which, from their cold and storminess, are altogether improper for wintering hogs on. In a case of this nature, and where the farmer is necessitated to keep wedder hogs, he must hold on with his old pasture, sickrife as it is; only, as young heath is easier and milder for the stomach, let him burn off as much of the old heath as he dares, reserving only such places as he knows to be an undoubted security in stormy nights and days. Indeed it will be wisdom in him to purify his pasture, by burning in the spring every species of a loose unprofitable grass that will burn. This regenerates the sward, renders the bite clean and wholesome, and not so apt to be mixed with impurities, should the hungry creature, during a storm in winter, grip closer and keener on it. As another mean of preventing it, let his hogs be distributed as equally as possible over all their ordinary range; and, in doing this, let the shepherd act with great care, judgment and sobriety ; particularly let him refrain from dogging them severely on any occasion whatsoever; for when hogs are put into a state of profuse perspiration by improper treatment, and then a sudden check given to this immoderate heat (and this always happens), it is very likely to raise the *sickness* on some of them. Again, if the *sickness* begin early, and its progress be rapid, so that the farmer has every reason to believe the deaths will be great, he may transfer the hirsel to another pasture for ten days or a fortnight, and, if the weather and other circumstances answer, he may do this for a month; and the cropping of the sward by older sheep, or the influence of the season as it advances, may neutralise the morbid qualities of the pasture, and the hogs may then return with safety. These measures taken, and gone through with care and prudence, may moderate the ravages of *sickness*, but, on a sickrife pasture, will not prevent it.

As stated above, it is the preceding day's feeding which is an immediate cause of this disorder. The animal will shew no symptoms of it at night, and it will be dead long before day. Yet it will not unfrequently happen that the shepherd will find some in the day-time attacked with it; and though there is but little hope that aught he can give will effect a cure, the following treatment may be recommended. In some cases, where the animal is soon discovered, it may do good. First let him open the jugular vein, about an inch before it divides itself at the angle of the jaw-bone. This vein is mentioned, because as the blood is getting very fast grumous and thick, it is apter to bleed freely than any of the smaller ones. For the same reason the operator may make the orifice longer than it is usually made in bleeding. To do it accurately, he must make a small slit in the skin, when the vein will appear. A good deal of blood should be taken. If it appear not likely to stem of its own accord, let him thrust a small sharp pin through the two sides of the skin which he laid aside, and with a ligature of half a dozen piles of wool, wrapped round the two ends of the pin, draw the opening he made in the skin close over the orifice in the vein, and the bleeding will stop. If the disease be considerably advanced, it will not bleed profusely. He may, in that case, open the vein on the other side of the neck, and that will take a little more from it. An ounce of Glauber's-salts may then be melted, and poured down its throat, or, if these are not at hand, a handful of common salt: the purge that will operate soonest, is best; for it is to be noticed that the whole mass of aliment that is in the other three departments of the stomach, intervenes between the physic and the place where the disease is begun; and in all probability the *reed* is by this time hard and bloody with inflammation, and its contents dried with heat, which no cathartic can penetrate or dissolve; and unless the circulation be immediately restored, the creature cannot live long.

This kind of treatment is suggested not from any experience of its proving successful in curing the *sickness*, but because bleeding certainly has a tendency to diminish the sickness, and even to mitigate the pain a little. The author does not recollect of ever curing one sheep by these means, though he has often used them; but if the animal bleed and purge freely, there will be for a while a sensible diminution both of pain and sickness; the creature's life may be prolonged a little, but it will scarcely recover.

As far as the knowledge of the writer of this essay goes, there has been no prescription the success of which in curing this disorder has ensured its being administered above a season in any place, or by any one individual—a certain indication that nothing effectual has been discovered. Indeed, by the time the animal exhibits external symptoms of the *sickness* (and the affected creature can be known no other way), in most cases, the disease may be considered as incurable. It is very probable that if the animal could be known in the first moments after it is seized, it might frequently be cured; but till its swelled belly, its sickly look, and its lagging behind its neighbours, indicate that the *sickness* is begun, there is no other method of ascertaining it; and by the time these symptoms are observable, the disease is considerably advanced.

Supplementary Remarks.—The sickness does not now prevail to such an extent as it formerly did in the south of Scotland. This is owing partly to the farmers raising their ewe-hogs among their breeding stock, and to the wedder-hog hirsels being almost entirely laid aside. Upon the introduction of the Cheviot breed to the Scottish hills, those fine pastures which were formerly occupied by wedder-hogs for the purposes mentioned in the above essay, were stocked with Cheviot ewes. Hence it will be seen that it is the kind of sheep that were its proper subjects that have fallen into disuse, and not that the disorder is prevented by any change in the seasons, in the quality of the pasture, in the constitution of sheep, or in man's management.

It is dry hard pasture, intermixed with strips of lea-heath, that is properly and radically sickrife. On a soft, easy-lying, spongy soil, *sickness* may make an appearance, and adventitious causes may make the deaths for a while considerable, but when these accidental causes cease, the mortality abates. Other causes are more or less powerful in disposing to this disorder only in proportion as they are modified or enforced by the quality of the pasture. Hence when these causes occur on a pasture naturally and radically sickrife, the numbers that are carried off are often immense.

Wedder-hogs are more subject to this disorder than ewe-hogs. Ewe-hogs wax and come to their yearly prime without any intervenient occurrence checking the growth and spread of the carcass. Wedder-lambs, by castration, are dwarfed in the size, and enfeebled in the constitution; and for a year or two cannot attain that strength and vigour to which their original component parts had power to carry them. This restriction of their parts induces to a softness of nature, which renders them fitter subjects of almost every species of disease. Two years in good habit sets them above casualties of every kind, and re-establishes the constitution.

From time immemorial it has been supposed that there are different species of the *sickness*; and our old shepherds, when they see a sickness-hog * opened, will immediately take it upon them to tell you of what species of *sickness* it has died. They enumerate the different kinds nearly in the following order: *Reed Sickness*, *Small-guts Sickness*, *Blood Sickness*, *Flesh Sickness*, and *Liver Sickness*. The writer of these observations grants that all these parts, even before the creature dies, are strongly affected by this disorder; but, in several sickness-hogs which he has killed, he found the *reed* inflamed when no depravity could be noticed in any other of the viscera, and in no case whatever has he found the *reed* uninflamed. Indeed, after death, especially if the weather be soft and fresh, the whole abdominal viscera hasten so rapidly to putrefaction, that one can scarcely determine which part has been first and most strongly affected. But, if the *reed* be opened, it immediately exhibits marks of a most morbid inflammation, viz. its inner coats entirely gorged with bloody serum. This serum often pervades that part of the aliment which has reached this department of the stomach; at other times the aliment will be free of it, but so dry that it will rub to powder between the fingers. These appearances induced the author to believe that there is but one species of *sickness*, and to this day he has never seen any reason to alter his opinion.

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* *Sickness-hog* is the appellation which the shepherd gives a hog that has died, or is dying, of *sickness*.

As stated in the essay, the position in which a sheep has lain a little while previous to its death, as well as the posture in which it lies after death, varies the depravity of the affected parts in endless degrees. For example, if a sheep dies of *sickness* with its head down-hill (and the reader must know that the acute agony which the creature suffers makes it throw itself into every shape and posture imaginable), much serum will be collected in that cavity in which the *heart* and *lungs* play; but particularly the fleshy parts of the carcass in the neighbourhood of these organs will be completely gorged with extravasated blood, which will squeeze out, and even run in copious streams to the ground, when the shepherd is taking off the skin. In this case the *small guts* will be pretty free of inflammation. Again, if a sheep dies of the *sickness* with its head up-hill, and lies in this state for an hour or two before it is dissected, the cavity within the *diaphragm* will be free of serum, the *heart* will be altogether, and the *lungs* nearly altogether, clear of inflammation; nor will any parts of the sheep's fore-quarters be much inflamed. The serum will, in this case, be collected in great plenty in the *abdomen*, and the inflammation of the fleshy parts will be confined to its flanks and hind quarters. In both cases the reed will exhibit nearly the same appearance. To conclude, it is needless, indeed it is impossible, to point out minutely every difference in the depravity of the organs, or in the degrees of corruption that have prevailed either in the carcass or in its viscera. These alter after the animal's death, according to the numberless postures in which it may have died; and if the air has been moist and fresh, the progress of putrefaction will have proceeded far more rapidly than if it had been thin, pure, and frosty.

EXPERIMENTS ON RAISING TURNIPS WITH MANURE, NOT FARM-YARD DUNG BY ITSELF OR IN COMPOST.

[Out of the reports that have been received by the Society of experiments on this subject, which was proposed several years ago, a few extracts are now given. From these, amongst other things, it is interesting to learn that successful experiments were made with ground bones in Kincardineshire, so long ago as the year 1820.]

Extracts from Mr HOWDEN*'s Letters on the subject of Manures, with accompanying Tables.*

I. *Experiments on Turnips.*

LAWHEAD, *5th November* 1823.

As I conceive it to be the object of the Society to draw useful and general conclusions, for the future guidance of agriculturists, from the results of the experiments that may be made, I will take the liberty of stating a few circumstances connected with the experiments that have been made under my direction, and which have influenced my mind in witnessing the results.

The field at Traprain * is a mixture of clay and gravel, rather too stiff to be well calculated for a turnip crop. It unluckily was deluged with rain soon after it was sown, which had the effect of crusting the drills, and consequently rendering the *braird* imperfect. It had likewise the disadvantage of being sown with seed of an inferior quality, as all the seed of my own growing was required for the other fields. The

* See Table I.

field at Lawhead, No. 1, is a soft sandy soil, naturally inclined to moor; while No. 2 is a good sharp gravelly soil, admirably adapted for turnips, as is clearly proved by the immense difference in the quantity of produce.

The result of the experiment, as it has been conducted under my immediate direction, goes to prove most satisfactorlly, that farm-yard dung, when properly *mixed*, *fermented* and *rotted*, (three things indispensably necessary in the preparation of this manure), is fully equal at least to any other species of manure which I have applied, and from the greater facility with which it is in every case procured, it seems to be entitled to the decided preference over every other kind. Bone-dust, when applied on what farmers term *hungry moor sand*, will be found very profitable when the carriage is distant, as a single cart can carry what is sufficient for an acre, and the experience of six years completely bears me out in stating its beneficial effects. Though the effects of rape dust may not continue to operate for such a length of time, yet I am clearly of opinion that it is a valuable manure. Fresh herrings and herring garbage, at the fishing season, when properly mixed up with lime compost, make a cheap and valuable manure. Allow me to add before I conclude, that, upon the field at Traprain, I caused half an acre * to be sown with turnip seed as follows: Six drills with herring compost—six drills with soot—one drill with urine—three drills with farm-yard dung—and six drills with rags. The result of this was, that the herring compost and farm-yard dung yielded a crop corresponding in weight with what is stated in the returns from the acres,—that the urine made a return so little inferior, as to induce me this season to construct a cistern for retaining the urine of the cattle, and the washings from the dung-pits, and that the soot and rags did not produce half a crop.

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* The measures of the author, though now obsolete, are still retained, as to reduce them to the imperial standard would give them a very fractional aspect.—Ed.

Comparative Cost of a Variety of Manures alternately with Farm-yard Dung, and the Weight of the respective Produce in Turnips, on each Scotch Acre, laid off in Drills of 27 Inches.

Field at Traprain, sown the 6th of June 1823.

Acres.	Manures.	Quantity.	Expence.					Produce.
			Prime Cost.	Carriage	Toll.	Filling & spreading	Total.	
		Tons.	S. D.	S. D.	S. D.	S. D.	£ S. D.	tons. cwt
1	Horse-dung, made within the month,	13	65 0	40 0	3 0	0 9	5 13 9	20 8
1	Farm-yard dung, stored in February	12		6 0		1 6		22 8
1	Bone-dust, . . .	1½	126 0	15 0	1 1½	1 3	7 3 4½	23 12
1	Farm-yard dung, .	12		6 0		1 6		26 8
1	Lime-compost, with 8 barrels herrings at 2s. 6d. . . .	34	47 0	17 6	1 0	*6 0	3 11 6	25 12

Field (No. 1.) *at Lawhead, sown the* 14*th of June* 1823.

Acres.	Manures.	Quantity.	Expence.					Produce.
			Prime Cost.	Carriage	Toll.	Filling & spreading	Total.	
		Tons	S. D.	S. D.	S. D.	S. D.	£ S. D.	tons. cwt
3	Sea-ware, at loads per acre, . . .	16		36 0		1 0		16 16
3	Bone-dust, at per acre, . . .	1¼	105 0	12 6	1 0	1 0	5 19 6	24 16
1	Farm-yard dung, .	16		8 0		2 0		29 12
1	Rape-dust bruised, .	1	86 0	5 0	1 0	1 0	4 13 0	21 12

Field (No. 2.) *at Lawhead, sown the* 12*th of June* 1823.

Acres.	Manures.	Quantity.	Expence.					Produce.
			Prime Cost	Carriage	Toll.	Filling & spreading	Total.	
		Tons	S. D.	S. D.	S. D.	S. D.	£ S. D.	tons. cwt
1	Street-dung, stored at Dunbar, . . .	16	55 6	40 0	12 0	1 0	5 8 6	34 8
1	Cow-dung, the produce of two cows through the season	16	55 6	40 0	12 0	1 0	5 8 6	34 16
1	Farm-yard dung, .	16		0		2 0		36 16

For turning the heap.

II. *Farther Experiments on Turnips.*

5th November 1824.

Following up my intention, stated in my former letter, I have again made out a table, wherein I have endeavoured to exhibit the expence and weight of turnip produce on ten Scots acres, crop 1824.

Experimental Field of Ten Scots Acres at Lawhead, Crop 1824, *sown with Turnip-seed, from the* 11*th to the* 15*th June inclusive; and Ten Falls of each of the Experimental Portions, weighed at the Linton Toll-bar,* 14*th November* 1824.

Acre.	MANURES.	Quantity.	EXPENCE.					Produce.
			Prime Cost.	*Carriage.	Toll.	Filling & spreading	Total.	
		tons cwt.	s. d.	s.	s.	s. d.	£ s. d.	tons cwt.
1st,	Sea-ware, crop injured by trees, .	20 0		52		1 3	2 13 3	15 0
2d,	Farm-yard dung, thrown up to ferment in January,	16 0		8		1 8		25 16
3d,	4 carts of herring-guts, and 6 tons of dung, with 12 yards of earth, turning expence included,	20 0	48 9	50	8	4 6	5 11 3	26 8
4th,	Farm-yard dung, .	16 0		8		1 8		26 0
5th,	Herring-compost & dung, as in 3d acre,	20 0	48 9	50	8	4 6	5 11 3	28 0
6th,	Farm-yard dung, .	16 0		8		1 8		26 0
7th,	9 carts coal-ashes, & 1 cart-load hen-dung, mixed with 10 cwt. horn-shavings, . .	10 10	105 5	45	9	1 0	8 0 0	20 7
9th,	Farm-yard dung, .	16 0		8		1 8		25 16
8th,	Bone-dust, . .	1 0	87 0	5	1	1 0	4 14 0	23 18
10th	Farm-yard dung, .	16 0		8		1 8		25 16

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* Carriage comprehends only the expence of bringing the manure from the place where it was purchased, to be stored upon the farm, and in no instance the carting from the store.

The author mentions, that the reason why there are no experiments with liquid manure in this table, is, because it was employed for moderating the fermentation of a large quantity of stable-yard dung, which he drove weekly from an innkeeper.—ED.

In this table the results upon some of the experimental acres, are seen to differ from those of last year. This difference, I think, arises from the land under crop this summer being better adapted to the bone manure, that is, sandy and light. It is worthy of remark, that, upon that acre, No. 7, consisting of thirty-two drills, where the horn raspings were strewed above the coal-ashes and hen dung-upon twenty-six drills; the remaining six being manured, three drills with horn raspings by itself, and three drills with the mixture of ashes and hen dung alone. I weighed the produce from the three drills where the raspings were put in, and they yielded, tops and tails, at the rate of only 2 tons 13 cwt. per acre, while the three drills where the ashes were spread, returned a weight exactly equal to the twenty-six drills, where both ashes and horn shavings were used. In a drill immediately beyond the line of the ten experimental acres, I caused one drill to be sown without any manure, and upon it the crop (to the eye) was much the same as that where the horn raspings were applied, which in truth did not deserve the name of a crop.

It may be worth mentioning, that the crops of wheat and barley, after the turnips of last year, were very equal. The spaces where bone dust was put in, I think yielded the best.

The whole of the fields upon which these experiments have been conducted, were limed about twelve years ago, at the rate of at least sixty barley bolls Linlithgow measure, per Scotch acre.

Experiments upon Beans and Turnips, the latter fed off by Sheep, and both followed by Wheat.

Upon four acres I sowed half an acre of turnips, and half an acre of beans alternately, which got equal quantities of farm-yard dung. After the bean crop was removed, the turnips were eat by sheep * fleched over the whole space, it was then ploughed and sown with wheat. The result proved the wheat on the bean land portions to be in appearance at least two bolls per acre more than on the turnip spaces; but the crop is not yet thrashed. This difference may in some degree be attributed to the land having been in a regular four course turnip shift for the last twenty years. The turnips, however, were excellent, and in appearance fully equal to the highest weight in the tables.

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* It has occurred to me to mention a circumstance relative to the consumption of the crop of turnip in 1824. The table shews the average weight of turnip per acre to be 24 tons 3 cwt. 4 stones of roots; and I

Experiments on Raising Turnips with different quantities of the same kind of Manure.

The author having, in his former communication to the Society, stated his intention of performing some experiments with different quantities of the same kind of manure, subjoins to a paper lately received on another subject, the following account:—

I laid off four Scotch acres of land to be sown with turnips, crop 1825. To the first I gave twelve, to the second sixteen, to the third twenty, and to the fourth twenty-four tons of good farm-yard dung. From the dry season, there was an imperfect braird, and a bad crop. Portions of the produce of all the lots were weighed at Linton toll-bar, when lots first, third, and fourth were found only to produce at the rate of sixteen tons per Scotch acre, while the second produced sixteen and one-half tons. I am aware that, in a moist season, the results would have been different; but as even the succeeding crop of wheat did not strike the eye as in any considera-

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we suppose the tops per acre to be 12 tons, these together would amount to 5065 stones. Now, I find that 480 black faced wedders that may weigh when fat about 14lb. Dutch per quarter, have eat exactly 1 acre, or 5065 stones every seven days. But it may be proper to mention, that the sheep were put upon a *bare* grass field the 15th October last, and only eat fourteen cart loads the first five days, after which they were *fleched* on the turnips. It must likewise be kept in mind, that sheep eat much less the first few weeks they are put to turnips than they do afterwards.

ble degree superior, I shall henceforth be shy in applying more than sixteen tons per acre of good farm dung to any crop.

Extracts from Mr BOSWELL'S *Letter on Artificial Manures, with Comparative Expence and Produce.*

KINGCAUSSIE, 1*st November* 1824.

THESE experiments were all made on one field, (which had been formerly "*out field*.") The turnips were all grown on drills twenty-eight inches wide; they were all Norfolk globe, and all sown within three days of each other. The season was the worst for a turnip crop which I have seen during fourteen years in the county of Kincardine, being both cold and wet; and this operated very much against the crop on the acre manured with bones, as they have no bulk to keep the ground open, and also require heat to cause them to ferment; but from my former experience of them, I am convinced that they are an admirable substitute for farm-dung. I beg leave to inclose the result of a former experiment in 1820; and to state, that, although I gave no dung to the bear crop in 1821 or in 1824, and although the field on which the experiment was tried in 1820 was poor high land, reclaimed from moor, the crop in both instances was very good. I also had two acres raised with bones, as the manure in 1822; and grown alongside of them turnip raised with farm-yard dung. Both crops appeared to be equally heavy on that trial also, but they were not weighed. I caused a drill to be left without bones in 1822, and here the want of manure was obvious, the plants growing sickly, and at last altogether disappearing. This was also the case in one or two small bits, where the girls employed in putting in the bones had neglected to put in any. In both trials, that is of 1820, and all of them in 1823, the *whole* of the crop was actually weighed on a hay steel-yard, and the turnips being cleared of tap-root, and all rotten leaves, were always brought home, a load of each at the same time.

I. Experiments to ascertain the Comparative Value of different Manures in raising Turnips. Crop 1823.

ONE ACRE MANURED WITH BONES.

24 cwt. bones, prime cost, - - - - -	L. 2	3	2
Carriage of ditto, 7 miles, - - - - -	0	7	0
6½ days man breaking bones, at 1s. 10d., - -	0	11	11
3½ days a girl spreading ditto in the drills, at 10d.,	0	2	11
Total expence on the acre, -	L. 3	5	0

	T.	cwt.	qrs.	lb.
Weight of turnips produced on 1 acre manured with bones,	20	16	3	25

Value in Cash

At 12s. per ton, - -	L. 12	9	7
Deduct expence of manure, -	3	5	0
Nett return, -	L. 9	4	7

ONE ACRE MANURED WITH RAPE-CAKE.

½ acre got one ton rape-cake, at - - -	L. 3	0	0			
Carriage ditto, 11 miles at 1s., - - -	0	11	0			
Collecting (and mixing cake with) 7 cart loads earth,	0	3	0			
Breaking rape-cake, - - - - - -	0	5	0			
Carting and spreading in the drills, - -	0	5	0			
				L. 4	4	0
½ acre got one ton rape-cake. Carriage ditto,	3	11	0			
Breaking cake, 5s.; putting in drills, 5s., -	0	10	0			
4 tons stable-dung, purchased and driven, at 8s.,	1	12	0			
				5	13	0
				L. 9	17	0

	T.	cwt.	qr.	lb.
Weight of turnips produced on ½ acre, with earth and rape-cake, - - - - - - - - - -	15	7	0	25
Weight of turnips on ½ acre, with rape and stable-dung,	16	2	0	6
Total weight of turnips from rape, -	31	9	1	3

Value in Cash.

At 12s. per ton, - -	L. 18	17	4
Deduct expence of manure, -	9	17	0
Nett return, -	L. 9	0	4

FARM-YARD DUNG.

¾ acre got 18 tons farm-yard dung, equal 24 tons per acre, at 8s., equal per acre, - - - - - - - - - - L.9 12 0

	T.	cwt.	qr.	lb.		T.	cwt.	qr.	lb.
Weight of turnips produced on ¾ acre,	24	17	1	1,	= per acre,	31	1	2	8

Value in Cash.

At 12s. per ton, - -	L. 18	12	7
Deduct expence of manure,	9	12	0
Nett return, -	L. 9	0	7

II. Comparative Value of Bones and Farm-Yard Manure, in raising Turnips. Crop 1820.

ONE ACRE MANURED WITH FARM-YARD DUNG.

20 cart loads (or tons) dung, including driving, 10s., - L. 10 0 0

	T.	cwt.	qr.	lb
Weight of turnips on 1 acre, - - - - - -	32	14	3	14

Value in Cash.

33 loads, at 10s., -	L. 16	10	0
Deduct manure, -	10	0	0
Nett return, -	6	10	0

ONE ACRE MANURED WITH BONES.

1¼ ton bones, at 42s., - - - - - - - -	L. 2	12	6
Breaking and driving ditto, - - - - - - -	0	18	0
	L. 3	10	6

	T.	cwt.	qr.	lb
Weight of turnips on 1 acre, -	28	13	3	8

Value in Cash.

29 loads, at 10s., -	L. 14	10	0
Deduct manure, -	3	10	6
Nett return,	L. 10	19	6

Nett return from bones, - - - - -	L. 10	19	6
Ditto farm-yard manure, - - - - - -	6	10	0
In favour of bones, -	L. 4	9	6

ON THE EFFECTS OF BONE MANURE ON DIFFERENT SOILS. By Mr SINCLAIR. *Appended to a Letter to* CHARLES GORDON, *Esq. Dep. Sec. Highland Society.*

DURING the dry summer of 1826, which, in most parts of England, particularly in the midland counties, was extremely unfavourable to the turnip plant, I had an opportunity of witnessing the effects of bone manure and farm-yard manure on that very important farm crop. A field of upwards of thirty-four acres of a siliceous sandy soil, on the estate of Sir Charles Throckmorton, Bart., at Buckland, in Oxfordshire, had been sown with turnips; and at the time I viewed the field, which was about the end of August, the half of it presented a remarkably fine crop of turnips, nearly a fourth part advanced in bulb, while the other half of the field exhibited the turnip crop getting merely into the rough or proper leaf. The mode of culture adopted here was that of the Northumberland or ridge practice. Such a very singular appearance as this crop exhibited, naturally induced a question as to the cause of so remarkable and decided a discrepance between the crop on one part of the field and that on the other; the soil it was evident, on examination, was of the same nature throughout, and I had been told that the whole crop had been sown within the space of a few days with the same kind of seed, and under circumstances alike as to the state of the weather. It should have been before observed, that, in the previous course of crops of this field, the turnip crop had partly been folded, and partly carried off for feeding; but, in the present case, there could not be observed the slightest difference in the crops on the parts which had been folded, and on those which had not; and the folding alluded to had extended to each of the divisions now so remarkable for discrepance of crop. I found that the portion of the field which carried so fine and forward a crop, had been manured with bones, and that which carried so inferior and late a crop had been manured with stable-yard dung, in the usual manner. There therefore appeared to be no other way of accounting for this difference in the crops of the two divisions of the field, but by imputing it to the different effects of the two distinct manures. But I suggested to Mr Williams (the very intelligent land-steward on the estate), the great probability of the manures having thus influenced the vegetation of the seed and growth of the plants from mechanical causes. The loose texture of the stable-yard manure would render the soil of the ridges more porous and obnoxious to the hot dry weather than the bones, which, being in pieces about the size of a walnut, more or less, and applied at the rate of thirty-six bushels per acre, would cause but little difference in that important point, but would leave the ridges as compact and consolidated nearly, as if they had been formed of the soil simply, or, in its natural state; and that, if a portion of the land had been sown without any manure, for the truth of comparison, the experiment would have been very complete. Mr Williams readily undertook to put this proposition to the test of practice in the following season; and, accordingly, this autumn, I had the satisfaction, when at Buckland, to see the results of another extensive trial of the manures above mentioned, with a portion of the land without any manure.

The soil was of the identical nature of that in the former extensive practical trial, but the season had proved more genial for the vegetation of seeds in general than that of 1826, and, consequently, on each of the separate trials, the turnip seeds vegetated nearly about the same time. The culture was, in this instance, conducted in the same judicious manner as in the former, that of the improved Northumberland ridge practice, and drilled at twenty-eight inches apart. The crops on the bone-manured ridges were greatly superior to those on the stable-yard dung; and those on the simple soil, or soil without manure, were greatly inferior to the last. The difference in the state of these three crops could be easily perceived at a considerable distance throughout the whole breadth of the field.

The superiority of bone-manure for an immediate crop being thus clearly confirmed, as regarded a soil of this nature, the next inquiry was of its permanency, or effects on the succeeding barley crop of 1827. The bone-manured soil here also maintained its superiority over that which had been manured with the stable-yard dung, to the extent of five bushels of barley per acre; and the crop of clover was better on the above manure, notwithstanding the superior weight of the barley crop.

To these facts in favour of bone manure, must be stated others of an opposite tendency. On the estate of T. B. Evans, *jun.* Esq. at Dean-House, in the same county, bones were tried for the wheat crop, also rape-cake dust, and stable manure. The soil here was a calcareous stony land. The stable-yard manure had, on this soil, as great an advantage over the bone manure and rape-cake dust, as the bones had in the former instance, in a siliceous sandy soil. The bone manured piece, and that with the rape cake, had crops apparently equal to each other, and but little if any degree better than the soil simply without any manure whatever.

A manure may be said to consist of any fertilizing matter, of which a soil has been exhausted by cropping, or of which it may be naturally deficient. An examination, therefore, of the component parts of the soils, and of the manure in question, may go far to explain the anomalous results obtained from the indiscriminate application of bone manure* to soils of different natures.

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* The component parts of bone are well known to consist principally in phosphate of lime, and decomposable animal matter. I propose to make some experiments on the relative quantities of these ingredients in the bones of different animals, which I shall be happy to communicate to you, as soon as they are made.

The soil on which the bone-manure had such beneficial effects contained, in 400 parts,

Fine siliceous sand 167 parts; calcareous sand 43; water of absorption 99, - - - - - - -	309
Decomposing animal and vegetable matter, destructible by fire,	24
Carbonate of lime (impalpable), - - - - -	25
Silica, or the pure earth of flints, - - - - -	23
Alumina, or the pure matter of clay, - - - -	9
Oxide of iron, - - - - - - -	3
Soluble animal and vegetable matter, principally vegetable extract, with indications of muriate of soda, - -	5
Moisture and loss, - - - - - - -	2
	400

The soil on which the bone-manure appeared to have no beneficial effect, consisted of,

Calcareous sand and gravel nearly pure carbonate of lime,	217
Decomposing animal and vegetable matters, destructible by fire,	17
Carbonate of lime (impalpable), - - - - -	39
Silica, - - - - - - - -	85
Alumina, - - - - - - - -	20
Oxide of iron, - - - - - - -	5
Soluble matter, principally vegetable extract, with sulphate of lime, or gypsum, - - - - - -	4
Moisture or loss, - - - - - - -	13
	400

The striking and essential point of difference between these two soils consists in the carbonate of lime. In the soil so much benefited by the bone-manure, carbonate of lime is deficient, while in the soil so little benefited by it, the carbonate of lime is almost in excess, at least had it not been so much in the form of gravel and sand, the soil would have been what is termed cold. The differences also between these two soils in the coarseness and fineness of their sand and gravel, and in the superior quantity of alumina or clay in calcareous soil, should not be overlooked.

The quantity applied to the siliceous sandy soil, where the bones had such beneficial effects, was 36 bushels per acre, partly supplied from the dog kennel, and partly purchased, the cost 1s. per bushel for the latter, and 4d. per bushel for breaking the former. On the calcareous soil the bones were recent, and applied in a larger quantity. On soils adapted to benefit from it, this manure, therefore, will appear of great value, when the important advantage of having the stable-yard manure entire for the wheat and grass crops, is taken into consideration. Animal matter being so much more easily decomposed than vegetable matters, the recent bones must afford nutriment to the soil very speedily, yet I have always found, that both animal and vegetable matter, before they become beneficial to an immediate crop, require a first stage of decomposition, and that this degree of fermentation or decomposition, is best effected before these substances are applied to the land. G. SINCLAIR.

P. S.—Since the above was written, I have received from Mr J. Williams of Buckland, a communication on the subject of his trials with bone manure, of which the following is an extract:—

"I could much have wished you to have seen my crop of Swedish turnips again, to have witnessed the extraordinary progress they made with the bone manure, over those grown on the stable-yard dung, and those grown without any manure. Those who have seen the crops besides myself, declare it to be their opinion, that the crop on the bone manure is fully one-third better than that on the farm-yard dung.

"The green globe turnip have exceeded my expectations. They were sown the 20th July, and a finer crop I could not look for: it is decidedly the best early as well as late turnip I ever cultivated."

NEW CROSS, near London,
January 22. 1828.

DESCRIPTION OF AN IMPROVED PILING-ENGINE, invented by Mr *Alexander Petrie, operative Mill-wright, Leith.*

SEE PLATE I.

Fig. 1. Plan or horizontal section taken at the level A A of the elevation. (See Figs. 2. & 3.)
Fig. 2. Front elevation of the line BC. (See Plan, Fig. 1.)
Fig. 3. Side elevation upon line DE. (See Plan.)

aa. Horizontal frame upon which is reared the whole fabric, which can be moved at right angles, by means of the wheels *bb*; these being so constructed as to admit of being turned quarter round.

cc. Upright frame upon which are fixed the iron plates *dd*, seen more distinctly at fig. 4.

The machinery is put in motion by means of the fly-wheel *ee*, wrought by the handle *f*. Upon the axle of this fly-wheel is placed the pinion *g*, which works into the cog-wheel *h*. Along with the axle of this cog-wheel *h*, the small pitch-chain-wheel *i* revolves, which, together with the other two pitch-chain-wheels *k* and *l*, causes the endless chain *mm* to revolve. The chain is furnished with two pair of projecting nobs of a cylindric form (seen at *n* and *o*). These, in their passage upwards, act upon two projecting prongs, which stick out from the back of the weight or piling-ram *p*, as seen at *q*, fig. 3. While the weight *p* is at rest, and as soon as the machinery is put in motion, the projecting nobs of the chain, catch upon the projecting-prongs at the back of the piling-ram, and raise it up till it comes to the position seen in fig. 2.; and the nob *n*, being drawn over the pitch-chain-wheel *l*, the support is thus withdrawn, and the ram descends upon the pile *r*.

4. is a plan of the piling-ram, with grooves on each side, which work upon the surfaces of the plates *dd*, and serve to keep it in due position.

DESCRIPTION OF AN IMPROVED GRAIN-DRILL MACHINE, *invented by Mr S. Morton, Agricultural Implement Maker, Leith Walk.*

SEE PLATE II.

In this machine, the large wheel, with its universal joint, the brushes and shutters, are on the same general principle as in Checkett's. But the hoppers are included in one box, and the seed escapes out of all the three by the revolution of three seed-cylinders upon one axle; and drills of different breadths are produced simply by the shifting of a nut that fixes a screw moving in a groove in the under frame, by which the distance between the two outside conductors and the central one (which is fixed) can be varied from 9 to 10 or 11 inches; and that the two small wheels may always be at the same distances respectively as the conductors, there are two washers (hollow cylinders), an inch in breadth, on the axle-arms of each, which may be transferred either to the outside or inside of the wheels, so as to make their distances from the outside conductors 9, 10, or 11 inches respectively also. The small wheels may be raised or depressed, so as to alter the depth at which the seed shall be deposited, by the action of a wedge, which retains the upright part of the axle in any one (at pleasure) of a number of notches, which are made similarly in both, and which are caught by an iron plate on the upper side of the arms which carry the axles. This machine may be still farther improved by increasing the number of conductors to five, instead of three, the latter number giving too light work to the horses. In consequence of its greater simplicity, the cost of this machine is not so great as that of the old form.

PLATE I.

Highd. Soc. Trans. Vol. VII

Mr. PETRIE'S PILE ENGINE.

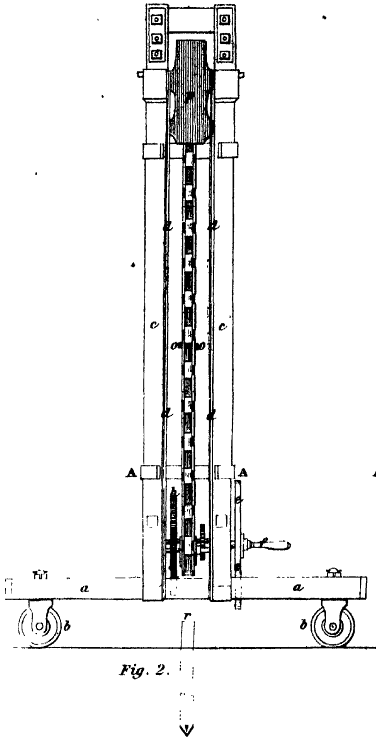


Fig. 2.

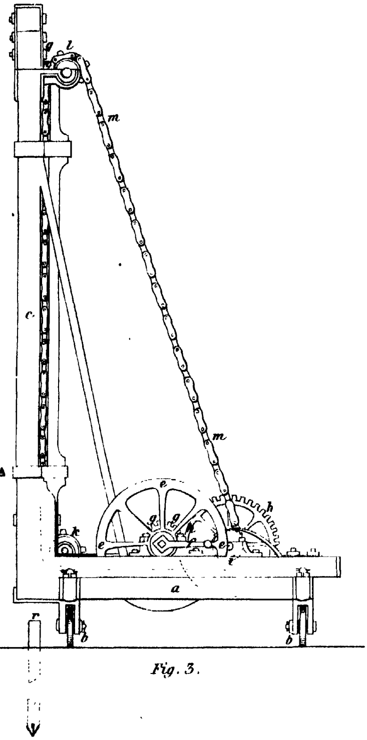


Fig. 3.

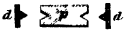


Fig. 4.

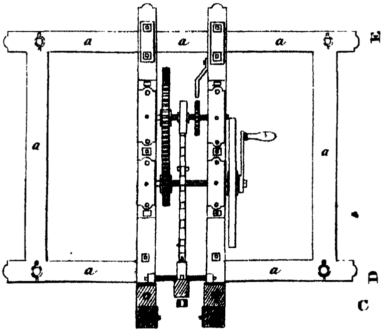
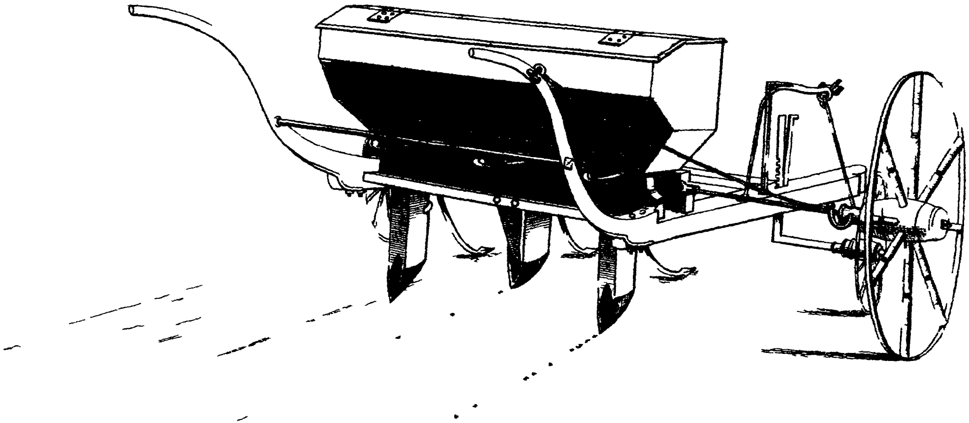


Fig. 1.

Engd. by W.H.Lizars

PLATE II.

M^{r} MORTONS IMPROVED GRAIN DRILL MACHINE



ESSAYS ON THE NATURE AND QUALITY OF SOILS AND SUBSOILS, AS INDICATED BY PLANTS.

[" The indications to be formed regarding the nature and qualities of soils and subsoils, according to the plants spontaneously growing upon them, having regard to elevation, exposure, climate, &c. with an account of the plants which prevail in particular soils, according as they have been a longer or shorter time in tillage," was a subject for Prize Essays, proposed by the Society in the year 1825, and subsequently in 1827. A mass of information has now been accumulated, which it has become desirable to publish, although, perhaps, the results have not been so satisfactory as could be wished. Only two of the Essays are given in this Number, as the subject will be afterwards resumed; nor is it to be inferred that the Society, as a ground of selection, has any particular favour for the views which are advanced in those now given. It will indeed be seen, that the authors entertain opinions very different from each other.—EDIT.]

ESSAY I.—*By* MR WILLIAM MACGILLIVRAY, *College Museum, Edinburgh.*

Felix qui potuit rerum cognoscere causas. VIRGILIUS.

THE plan which I conceive to be one of the best, according to which, some solution may be given to the questions proposed, is the following :—

I. *Indications regarding the Qualities of Soils elicited from the Plants Growing upon them.*

I. General observations, having direct reference to the subjects under discussion.

II. A classification of soils, with observations on their nature and relations.

III. An examination of the vegetation of a particular country, with relation to the soil, such as may be done by direct inspection.

IV. An exposition of the influence of various circumstances or relations, such as elevation, exposure, shelter from winds, shade, moisture, thinness and depth of soil, colour of soil, nature of subsoil, vicinity to the sea, and to high mountains, and on the vegetation viewed in connection with the soil.*

V. General influences deduced from the observations detailed under the two last heads, comprehending the indications that may be formed of the nature and qualities of soils and subsoils, from the plants growing upon them.

II. *Influence of Cultivation upon the Vegetation of particular Soils.*

VI. Enumeration of the principal plants which prevail in particular soils, according as they have been longer or shorter in tillage, together with some general observations relative to vegetation and agriculture.

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* The Introduction, the Second Part, Article IV. of the First Part, and a few other passages in this Essay, are, *for the present*, omitted. What is now published, however, will convey a full idea, in the author's own language, of his views on this subject, and the facts by which they are maintained.—(EDIT.)

I. *Some General Observations, having direct reference to the connection existing between Soils, and the Vegetables growing upon them.*

Every one who has been in the habit of looking upon nature with a curious eye, must have observed, that certain soils produce plants in some measure peculiar to themselves, and which do not appear to any extent in other soils. Thus, taking a few examples from our own country, Arundo arenaria*, Triticum junceum, Carex arenaria, are never observed elsewhere than in sand; Calluna vulgaris, Erica cinerea, Erica tetralix, are only seen where there is a surface-layer of peat; Hieracium murorum, Arenaria serpyllifolia, Aira caryophyllea, are usually found in soils of which pebbles and gravel form a principal part; Senecio vulgaris, Stellaria media, Sonchus oleraceus, and various Chenopodia thrive, if not exclusively, at least best, and exist in the greatest quantity, in rich mould. Similar examples occur in other parts of the world; and from the Aloe and Mimosa of the sandy and arid deserts of Africa, to the magnificent palms of the rich alluvial and vegetable soil of the plains of the Orinoco, we find appearances that would indicate the phenomenon to be of a general nature. The question, then, naturally presents itself: Is this universally the case? Do certain plants grow only in certain soils, or prosper only in certain soils? It becomes obvious to a person reflecting on this subject, that soils are extremely diversified, that few kinds exist simple, that there is a general blending of them in nature, that, in short, our divisions here, as in almost every thing else, are, in a great measure, arbitrary, and rather bear reference to some particular object existing in the mind, than conform themselves to nature itself, where they find their analogies only with certain, and often with great latitudes of meaning. The inquirer, therefore, has now such questions suggested to him as these :—Although there may be, and undoubtedly are, plants which belong exclusively to certain soils, are there not many others which cannot be said to belong to any soil in particular, but are diffused over many varieties of soil, thriving, if not equally, yet, to a certain degree, in them all; while, perhaps, the great mass of vegetation consists of species which occur in every possible soil? If this be really the case, would it not tend to induce a belief, that however necessary soil may be to vegetable existence, yet the qualities of this soil cannot afford a key to the distribution of vegetable forms, which must be sought for in circumstances having perhaps no relation whatever to the soil. And, indeed, may not a mistake, not uncommon in other matters, have been made with reference to this subject, namely, that of taking a circumstance of connection for a primary and direct cause; and may not a very undue influence have been assigned to the nature and qualities of soils as modifying the vegetation, merely on account of a prejudice arising from the more obvious connection of plants with the ground, than with other substances whose nature, long unknown, even yet excites attention only in a slight degree, because they impress themselves but little on the senses.

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* For the English names, see the Appendix, page 117.

In attempting the solution of these and similar questions that may occur to him, the inquirer will have, in the first place, to form to himself a clear conception of the different kinds of soil; for without making such a preliminary step, his progress will be obstructed by innumerable difficulties. After ascertaining and distinguishing the soils, so, at least, as to attach definite ideas to them, and to be able to render his observations intelligible to others, he might proceed to determine what pure soils produce peculiar plants; what plants are produced or fostered by the various intermixtures of these soils; what species of plants are generally, or very extensively, diffused among soils. Many other subordinate subjects would present themselves; for as no department of natural history is isolated, we may proceed from any point, to trace, by their connection and mutual relation, the whole range of phenomena exhibited in the wonderful fabric, of which we form a part.

With certain exceptions peculiar to certain districts or regions, or, speaking more correctly, to certain geological formations, soils are, in a great measure, the same all over the globe. So long as we observe the same rocks occurring in the most distant parts of the world, the fragments of these rocks must be similar in their nature, and the soil which is composed of these fragments must also be similar. Or, if we view soils as consisting not so much of disintegrated as of decomposed rocks, still they must exhibit a greater or less degree of resemblance; although peculiarities of climate, and the different nature of the vegetation in different climates, may give rise to considerable modifications. Thus, in the northern and temperate parts of Europe and America, where the decomposition of vegetable matter is slow, on account of the diminished temperature, we find those accumulations of half decomposed vegetables, which constitute our peat tracts, and which have a great influence on the vegetation and aspect of a country; whereas in the tropical regions, in the forests of Ceylon and of Brazil, where vegetation is infinitely more luxuriant, decomposition is effected so rapidly, that none of these accumulations can take place. Still, however, a trap or sandstone district in Bundlecund, will produce the same soil as a similarly constituted district in Scotland; and the granite of the Himalayan Mountains will form the same sand and gravel as that of the Grampians. In all this, it will be apparent, that I do not mean to assert an absolute or even a relative similarity of soil, in all parts of the globe; or, in other words, to imagine, that all countries are more or less similar as to the nature of their superficial strata; for this is by no means the case; but two given countries or districts, having the same geological constitution, will also necessarily have the same soil, unless that soil be alluvial or diluvial, in place of being derived immediately from the subjacent rock.

But the case is very different with regard to the plants which grow upon these soils; and to any one at all acquainted with the distribution of vegetables over the globe, it would never occur to classify them according to soil exclusively. The sands of Southern Africa, and the sands of Northern Europe, present no common features of vegetation. The marshes of Surinam and those of Lapland, are characterized apart by a peculiar vegetation. In short, every species of plant has a certain range of its own, beyond which it does not extend; and the more remote any two countries are from each other between the Equator and the Pole, the more distinct is their vegetation, so that a Norwegian landing at Rio Janeiro, finds himself, as it were, in a new world, the vegetation of which recalls nothing of that from which he has come, whatever the geological or geographical nature of the country may do.

In attempting to solve a question, therefore, having reference to the relation existing between vegetables and soils, any general results that might be elicited, seem to be beyond the limits of our present state of information. In fact, before any such results could be attained, we should require for data, accurate and perspicuous accounts of all the different countries and climates of the world, viewed with reference to their soils and plants. But of such data do we yet possess even one? The botanist has gone forth by himself, and described the vegetation of an unknown region; the geologist has followed in his steps, but he has noted the rocks and their mutual relations only. None has yet been able to look upon nature with an eye capable of seizing all her features. Humboldt may, perhaps, be said to have made the attempt; but many Humboldts must run their career before the complicated organization of mundane nature can begin to become intelligible.

Instead of wandering, therefore, among the thick mists by which the secrets of Nature are concealed from our view, it would be wiser to select a spot, however small, where the partial illumination might enable one to find his way. Instead of attempting to elicit any general conclusions from a defective, and at the same time necessarily unsatisfactory, view of many extensive and remote regions in conjunction, I prefer confining my researches to a single country, tolerably well known. The subject, therefore, may be understood as applying to Scotland only; and this arrangement, I should hope, may prove satisfactory to the Society for other reasons, as well as that mentioned above.

II. *A Classification of Soils and Subsoils, with general observations on their nature and relations.*

In an agricultural and phytological point of view, soil may be defined to be that stratum of *loose* matter, whose upper part, constituting the actual surface of the earth, is in direct contact with the atmosphere, and which extends as deep as the roots of vegetables penetrate. It is in this sense that I shall forthwith speak of soils. The subsoil is the stratum lying immediately under the soil, and extending to an indefinite depth. When the subsoil is distinctly terminated by another stratum of a different nature at no great depth, a second subsoil may be enumerated; and, if necessary, more, should a similar occurrence take place again. The soil may be limited in its superficial extent, by the solid rock appearing at the surface. When this is the case, no soil is said to exist in such places. The subsoil, however, may be either loose matter or solid rock; for the latter is considered as subsoil, as much as a substratum of clay, marl, or sand would be; but where there is no soil, there cannot, of course, be any subsoil.

The soil is formed of the disintegrated or decomposed parts of more solid parts or rocks, or of the sediment supposed to have been left by some fluid, which formerly held it in solution, or supported it in mixture, generally more or less intermingled with vegetable matter. Sometimes, however, as in the case of peat, it may consist of vegetable matter alone. Occasionally it consists of the disintegrated particles of the rock on which it immediately reposes, as is the case, for example, on the summit of Bennabuird, and on the detached rock to the east of Stirling Castle, the former being granitic, the latter greenstone. This, however, is but seldom the case; and upon the solid rock, we more frequently find imposed a variable quantity of matters differing entirely from it. Thus, in the Trosachs, where the rock is a variety of mica slate, we observe first a bed of sand with pebbles of various kinds, and above this a layer of peat.

The surface-layer of loose matters, constituting what in ordinary language is termed the soil, may consist of one substance, or of many, intermingled with a variable proportion of vegetable debris, or it may consist of vegetable debris alone. The principal substances of which soils are composed, are, quartz, felspar, carbonate of lime, augite, hornblende, mica, oxide or hydrate of iron, argillite, carbonaceous matter, decayed vegetable fibre. The more ordinary chemical ingredients are, silica, alumina, lime, magnesia, oxide or hydrate of iron, oxide of manganese, &c. With respect to mechanical nature, soils consist of rounded or rolled fragments of rocks of all sizes, of angular fragments also of every dimension, and of cohering or loose particles of various kinds and qualities.

The chemical agency of the constituent particles of soils appears to me to be more imaginary than real, inasmuch as they would seem to have been saturated with the principles with which they combine, and which they imbibe from the atmosphere, and therefore, in general, until they are decomposed by other agents applied by man, they remain inert, without exerting either a chemical action upon each other, or a stimulating one upon the roots of vegetables imbedded in them. Thus it is known that lime, applied to land for agricultural purposes, by becoming converted into a carbonate, soon loses all its energy, and no longer possesses a quickening power upon the living, nor a decomposing one upon the dead vegetation of the soil with which it has been intermixed. The manner in which soils operate upon vegetables, therefore, depends upon their circumstances as to compactness or looseness, impregnation with water, or dryness, exposure to the sun or weather, or other accidental circumstances, among which the degree of comminution of the particles occupies a prominent place. The siliceous matters of soil form pebbles, gravel and sand, the calcareous sand, the aluminous clay, the other substances, clays, marls, and sands of various kinds. Sand and gravel are generally ferruginous, and the clay is intermixed with sand and iron; and the various mechanical intermixtures produced by these primary ingredients of soils constitute all that variety which is found between the solid crust of the earth and its geographical surface.

Soils might be variously arranged:—according to their chemical, their mineralogical, or their mechanical nature. The latter circumstance having more influence upon the vegetation than the others, an arrangement, conducted in conformity to this principle, would more directly suit the purpose in view in our present investigation, in so far as relates to purely mineral soils. Vegetable soils do not admit of such an arrangement, because their varieties are merely modifications produced by the variable nature of the plants from which they are produced, and a more or less advanced state of decay. Our inquiries being confined to Scotland, it becomes superfluous to include any soil that does not occur in that country.

I. MINERAL SOILS.

1. *Pebbles.* Rounded fragments of rocks of various sizes, from a foot diameter to that of an inch, and of various qualities, consisting, however, chiefly of primitive rocks.

2. *Gravel.* Rounded fragments, from the size of a walnut to that of a pea, of various qualities, but generally composed of primitive rocks, and especially quartz.

3. *Grit.* Angular fragments, of the size of those constituting gravel, and of various qualities, secondary as well as primitive.

4. *Sand.* Rounded fragments, from the size of a pea to that in which the particles are scarcely perceptible.

* Siliceous or quartzy sand, when it consists chiefly or exclusively of quartz.

** Calcareous sand, when it consists chiefly or exclusively of comminuted shells of molluscous animals.

5. *Dust.* Particles so minute as to be blown about by the wind when dry. In a wet state this soil forms mud.

6. *Clay.* Minute particles, adhering closely when moist and in that state possessed of plasticity.

Var. 1. Marl, clay mixed with calcareous matter.
2. Loam, clay mixed with siliceous matter.

II. VEGETABLE SOILS.

7. *Vegetable Mould.* Friable when dry, muddy when wet, but neither adhesive nor plastic, carbonaceous, consisting of decomposed vegetables.

8. *Peat.* Consisting of partially decomposed vegetable matter; soft and plastic when wet, hard and coheren when dry.

Var. 1. Compact.
2. Spongy.
3. Fibrous.
4. Woody.

Considered as soils, these substances may, without losing their character, be variously intermixed with other matters to a small extent, and still go under the name of pure soils. Soils of this description, however, are not so common at the surface as those of a mixed nature. In the same field there may be pebbles, gravel, sand, clay, and mould, intermixed. When one substance predominates in a high degree, the soil may be designated by the name of their principal ingredient, in the following manner:

9. *Pebbly soil,* soil in which pebbles form the predominant ingredient.
10. *Gravelly soil,* in which gravel is predominant.
11. *Sandy soil.*
12. *Gritty soil.*
13. *Clayey soil.*
14. *Peaty soil.*
15. *Vegetable soil.*

But it must be remembered, that vegetable matter exists in all soils, and it is only when there is enough of it present to give the soil a dark colour, that such soil is denominated vegetable soil.

The combinations of soils being so various, we can only further, as in the case of colours, apply names to the more prominent varieties, dependent upon local circumstances. In the present case, however, it is not necessary to go to a greater length in the enumeration of soils, as those mentioned will suffice for the illustration of our subject.

III.—*Examination of the Vegetation growing upon the different species of Soil enumerated in the preceding Division, in Scotland, with general Observations connected with the Physiology of Plants.*

Instead of prefixing to the account of the examination proposed to be instituted here, certain general observations, connected with the physiology of plants, and the influence of climate, altitude, and exposure, upon vegetation, a due attention to which would be of great utility in enabling us rightly to interpret many of the phenomena of nature, I prefer making these observations cursorily, as they may be elicited by occurrences, both to prevent myself from viewing the objects under consideration, through a coloured medium, and others from entertaining the idea that I have been influenced by preconceived opinions.

1. *Plants growing among pebbles.*—This species of soil is not of common occurrence. The only situations in which I have observed it, are, maritime and lacustrine beaches, and the edges of rivers. The plants which occur on the stony beaches of the Bay of Nigg at Aberdeen, between Musselburgh and Portobello in Mid-Lothian, at Kyle-Rhea in Skye, between Girvan and Ballintrae in Ayrshire, are, Silene maritima, Statice armeria, Cochlearia officinalis, Plantago maritima, Glaux maritima, together with Potentilla anserina, Rumex crispus, and a few pasture plants. At Nigg and Kyle-Rhea, the beautiful Pulmonaria maritima occurs; and at Girvan, the singular Eryngium maritimum and Salsola kali. On the pebbly shores of Loch-Lomond and Loch Kateran we observe Prunella vulgaris, Rubus fruticosus, Bellis perennis, Plantago media, and a few other plants common to the neighbouring pastures. On the pebbly beaches of the river Dee, in the parish of Peterculter, about six miles above Aberdeen, the plants observed by me, in 1819, were, Anthyllis vulne-

raria, Statice armeria, Silene maritima, Polygonum aviculare, Achillæa millefolium, Oxyria reniformis, Galium verum, Teesdalia nudicaulis, Linum catharticum, Alchemilla vulgaris, Alchemilla alpina. On the pebbly margins of the same river, in Braemar, I observed, in the same year, Alchemilla alpina, Oxyria reniformis, Achillæa ptarmica, Galium boreale, Anthyllis vulneraria, Saxifraga aizoides, Alchemilla vulgaris, Apargia autumnalis. Without drawing any general inferences from these facts, we observe merely in recapitulation, that, in maritime situations, pebbles produce maritime plants, common to other soils; in lacustrine situations, the ordinary plants of the neighbouring pasture-grounds, that have straggled into it; and by rivers, maritime, or ordinary pasture plants, or alpine plants, according to the vicinity of the locality to the sea or to high mountains. In such soil the vegetation is always thin and scanty. In wet seasons, it is sometimes luxuriant enough; but in dry weather it is liable to be burnt up by the heat of the sun.

2. *Plants growing in Gravel.*—Gravel exists in a pure state, in too small quantity to become of much importance as a soil. It is only on the sea-shore, along the banks of rivers, where the ground has been cut to a considerable depth, or about artificial excavations, sand-pits, for example, that we find it in any quantity. The vegetation which occurs in the latter sort of situation has nothing very peculiar. In the sand-pits at Aberdeen, as well as about Edinburgh, the plants observed are, Polygonum aviculare, Rumex acetosella, Agrostis vulgaris, Aira caryophyllea, Festuca duriuscula, Arenaria serpyllifolia, Hieracium murorum. These, together with Papaver dubium, P. Rheas, Polygonum convolvulus, Chenopodium urbicum, Lolium perenne, Bromus mollis, form the greater part of the vegetation of such places. On the sea-shore, gravel produces maritime plants—Cakile maritima, Chenopodium maritimum, Atriplex laciniata, Silene maritima, and others, intermixed with ordinary pasture-

plants: on the sides of rivers, some of the common pasture-plants of the neighbouring grounds; together with a few fluviatile and palustrine species, such as, Juncus bufonius, J. acutiflorus, Littorella lacustris. Sometimes even in situations very distant from high mountains, many alpine plants are seen among the gravel on the sides of rivers that flow with great rapidity; as is the case, for example, with the river Dee, which, within a few miles from its mouth, presents the Oxyria reniformis and Alchemilla alpina. In alpine valleys, such plants occur more abundantly. In the bottom of lakes, gravel produces lacustrine plants with slender stems, such as, Lobelia Dortmanna, Potamogeton natans, Myriophyllum spicatum. On the summits of high mountains, it produces alpine plants; Salix herbacea, Cochlearia officinalis, Statice armeria, Thalictrum alpinum, Juncus trifidus, Oxyria reniformis, as on the summits of Ben-na-Buird and Cairngorm.

3. *Plants growing in Grit.*—By grit, is here meant the peculiar sort of gravel derived from the recent disintegration of rocks, and which generally occurs in the place in which it was originally formed, without having been transported to a distance by water, and, consequently, without having assumed a rounded form. Grit, then, is gravel consisting of angular particles. It is peculiar to mountainous districts, and occurs chiefly where the bare surface is precipitous or rugged, and of a nature easily acted upon by the atmosphere and temperature. Many of the felspar and porphyry mountains of Strath in Skye, have their declivities covered with grit. It is also of frequent occurrence in Braemar. It produces plants by no means peculiar to itself, but such as thrive in other soils, and especially gravel, under similar circumstances; near the summits of high mountains, Salix herbacea, Thalictrum alpinum, Alchemilla alpina, Lycopodium selago; by subalpine springs, Saxifraga stellaris; by subalpine torrents, Saxifraga aizoides, Epilobium alsinifolium, Alchemilla

alpina, Gnaphalium supinum; farther down, Tussilago Farfara, Hieracium murorum; in low parts, common pasture-plants; by the sea, maritime plants.

4. *Plants growing in Sand.*—Sand in its pure state exists as soil, in this country, only in the immediate vicinity of the sea. It is a maritime soil, and produces plants which are peculiar to such a situation. Considered, therefore, simply as sand, it cannot be determined what plants belong to it; but, connecting the circumstance of its situation with its nature, we can satisfy ourselves as to its vegetation. The sandy deserts of the other parts of the world produce succulent plants, which, like the camel and glama that traverse them, are enabled, by a peculiar structure, to lay up a store of water sufficient for their exigencies during a long period of dry weather. In other cases, they are covered with juiceless, prickly, and shrubby mimosæ. But in Scotland, where there is at all times an abundant supply of moisture, sand produces neither succulent nor juiceless plants, but such as would seem, from their long tenacious roots, to have been intended to fix down the soil in which they grow, and, by their harshness and toughness, to afford no attractions to the herbivorous animals that might otherwise thwart the intentions of nature in solidifying the soil.

Two principal modifications of this sort of soil exist in Scotland. The sand of the east coast consists of particles of quartz, which are very fine and angular in some places, as from Aberdeen to Peterhead, larger and rounded in others, as on the Forth shores of Fife. The sand of the west coast, and especially that of the Outer Hebrides, where there is the most extensive display of sand to be met with in Scotland, excepting perhaps that on the shores of the Murray Frith, is calcareous, consisting almost entirely of comminuted shells.

Examining a portion of sand on the east coast, that, for example, between the mouths of the rivers Don and Ythan, we find it chiefly occupied with Arundo arenaria.* In this tract the sand, immediately above high-water mark, is accumulated into small hillocks, which extend along the shore in an uninterrupted series, having a breadth of several hundred yards. On these hillocks, along with the Arundo arenaria, occur Triticum junceum, Festuca duriuscula, Carex arenaria, Galium verum, and other plants, furnished with long slender roots, among which there are here and there found Hieracium pilosella, Aira caryophyllæa, A. præcox, Cerastium tetrandrum, Lotus corniculatus, and other pasture plants, which thrive in a light and loose soil.

On the side next the sea of this series of hillocks, and along the high-water line, where some fuci, shells, and other matters have been thrown up, we find Cakile maritima, Chenopodium maritimum, Atriplex laciniata, and in some places Arenaria peploides, and Salsola kali.

On the side next the land, where the declivity of the range passes into a plain of greater or less extent, and in which the sand becomes intermixed with vegetable matter, we find Ulex europæus, Lolium perenne, Euphrasia officinalis, Campanula rotundifolia, Apargia autumnalis, Sedum sexangulare, various Gramineæ and Leguminosæ.

Examining now a portion of the Hebridian sand, that, for example, at Luskentir in Harris, where the same hillocks are formed, we find that here the very same order is established as on the east coast of Scotland, notwithstanding the chemical difference in the nature of the soil, which, I have already observed, would seem to have in general little influence upon the vegetation, because no longer subject to be acted upon by the principles contained in the atmosphere. The dense tufts of Arundo arenaria form the principal feature of the vegetation, existing in a nearly unmixed state toward the sea, and becoming mingled with the plants mentioned above toward the land. The line of high water also presents the very same phenomena.

Sand forming the bottom of the sea, and on an open coast, very seldom produces any vegetation whatever. It is only where pebbles or shells occur in such places, that some algæ and confervæ are observed. This may be seen wherever a large interval is left between the lines of high and low water, as on the numerous and extensive flat sands of the Hebrides, there denominated Fords. The reason of which is simply, that although marine plants being exclusively nourished by the water, derive no benefit as to their development from the soil, they yet require a point of support or attachment, with which, however, sand cannot furnish them, as its particles are perpetually shifting place. Where there is a substratum of gravel or clay, however, or where the sand is mixed with pebbles or mud, vegetation makes its appearance; and in such places, other circumstances being favourable, we frequently observe great fields of Zostera marina, as between the island of Ensay and the mainland of Harris.

5. *Plants growing in Dust and Mud.*—Dust is a species of soil, in which the particles are still more minute than in sand. In volcanic countries, such as Iceland and Sicily, it is frequently sufficiently abundant; with us it nowhere occurs in any quantity in a loose state; but bound down, and in some measure consolidated, it forms the bottoms of many of our lakes and rivers in the form of mud. When this mud is mobile, or when in places exposed to be acted upon by agitations of the water, it produces little or no vegetation. In quiet places, and when somewhat solid, it gives rise to various Potamogetons, Myriophylla, Confervæ, together with Nymphæa alba and Nuphar lutea, as well as occasionally Ranunculus aquatilis, and a few other plants; and, by the margins of lakes and pools, to Equiseta, Arundo Phragmites, Scirpus lacustris, Sc. palustris, several Junci, Ranunculus lingua, R. flammula, Menyanthes trifoliata, and other plants peculiar to such situations, but which thrive in other soils similarly placed. Soil of this description is more common in lakes and pools in low situations, than upon mountains.

6. *Plants growing in Clay.*—This substance does not appear to exist anywhere at the surface, to an extent that would render it very worthy of notice, with reference to its vegetation. As a subsoil, however, it possesses much importance, for it is very extensively distributed, being found over all sorts of rock formations, from granite downwards. When laid bare by artificial removal of the soil above it, it affords a basis to a few straggling plants, chiefly grasses, Poæ, Festucæ, Agrostides, Polygona, and Chenopodia, of those species that occur in its vicinity.

7. *Plants growing in Vegetable Mould.*—This soil, which is among the most important in respect to its modifications, is scarcely ever found in a pure state. The nearest approach to it is seen in the dark-coloured soil that occurs in pasture grounds occupied by a rich vegetation, consisting of soft herbaceous plants, that have never been turned up by the plough. Pastures of this description are easily known by their peculiar verdure, and afford the most nutritious, as well as the most agreeable food for all sorts of cattle. But considered in a truly simple point of view, without being intermixed with other soils, it can scarcely become an object of investigation.

8. *Plants growing in Peat.*—It is not easy to define peat, or to select those characters which occur in all its numerous varieties. The plants of which peat is formed at the present day, are of very variable nature. In places where the vegetation consists chiefly of Calluna vulgaris, Erica cinerea, Melica cærulea, intermixed with Carices, Junci, Scirpi, and mosses and lichens of various kinds, the peat is, when dried, of a soft, friable, rather scaly than fibrous, and spongy structure, with a very uneven irregular fracture, of a light brown colour, and comparatively light, without any appearance of wood, and with few fibres. Where the vegetation consists chiefly of Cyperaceæ, Carices, Scirpi, and Junci, the peat, when dry, is almost entirely fibrous, tenacious, and spongy,

rather to be torn asunder than broken, of a brownish-grey colour, and light. Where a large proportion of the vegetation consists of gramineæ, such as Melica cœrulea, Aira flexuosa, together with Cyperaceæ and Heath, on elevated situations, and on steep declivities, the peat is, when dry, of a darker colour, more compact, and heavier. In marshy places, where there are tufts of heath here and there, the intervening spaces covered with water during a great part of the year, and giving rise to Sphagna, Eriophora, Menyanthes trifoliata, Pedicularis palustris, and Pinguicula vulgaris, the peat, when dry, is of a dark-brown colour, of a somewhat dense structure, breaking with a more even fracture, and having numerous fibres interspersed. In certain more or less level tracts, there occurs a species of peat characterized by the remains of twigs, branches, and roots of trees running in all directions through it. This kind, when dry, is of a light-brown colour; it is brittle, with an irregular fracture, and is light, because, of the woody parts, the bark only remains, the rest being decomposed.

Again, peat varies exceedingly, according to its distance from the surface. At the top it may be fibrous, and of a brownish-grey colour. Lower, it may be friable, scaly, of a light brown, and with few fibres. Still lower, it may be compact, of a deep brown, with an even fracture, and of greater specific gravity. Lower still, it may be yet more compact, with a smoothish fracture, of a pitch-brown colour, hard, or even brittle, and sometimes capable of considerable polish.

By peat, therefore, I understand a substance of a brown colour, varying in texture from fibrous to compact; of a less specific gravity than water, when dry; plastic in its moist state when compact, and in some degree, even when fibrous, capable of burning with flame and smoke, and composed of decayed and partly decomposed vegetables.

If we now examine this substance in all kinds of situation, and under every condition of wetness, dryness, elevation, exposure, and so forth, we find, as its universal inhabitants, Calluna vulgaris, Erica cinerea, E. tetralix, Empetrum nigrum, Scirpus cæspitosus, Nardus stricta, Eriophorum vaginatum, Carex panicea, various Junci, and especially Carices, and a number of plants not peculiar to itself, as Pedicularis sylvatica and palustris, Drosera rotundifolia and longifolia, many Carices, several Grasses, Eriophora and Junci. The two common heaths, however, are the characteristic plants of this soil. From the lowest peat tracts in the vicinity of Aberdeen or Stirling, to the summits of Cairngorm or Benledi; from the level bogs of North Uist, Benbecula, and Lewis, half covered with water, during a considerable portion of the year, to the mountains of Barry or of Harris, which, from their steepness, are as well drained as a wet climate will permit them to be, these plants are every where seen. Nor is the different nature of the subsoil any impediment. On the sides of Ben Nevis, where it is gravel mixed with clay; in Glencove, where it is pebbles of various sizes mixed with clay and gravel; on the mountains of Barray, where it is decomposed gneiss; on those of Lewis, where it is frequently a tough blue clay, mixed with angular fragments of primitive rocks; on those of Harris, where it is generally solid granite, gneiss, and syenite; in the Trosachs, where it is coarse sand and gravel; on Blair-Drummond Moss, where it is carse clay; and on the low tracts of Murray and Nairnshires, where it is fine quartzy sand, we everywhere find the same Calluna and Erica, intermingled with the same Carices, Junci, Scirpi and Eriophora.

With respect to elevation, also, we find very little difference in the nature of the vegetation furnished by peat soil. From the level of the sea to the height of 3000 feet, the same plants occur in most parts of Scotland, where there is ground of that elevation. And, if similar species do not occur on the very summits of our higher mountains, it is because the peat soil has disappeared there, and the climate and exposure have become essentially altered. Even exposure, in so far as regards the plants growing upon peat, has very little influence; the vegetation on a mountain, all other circumstances being the same, is much about as luxuriant on the north as on the south side. In general, however, as in all other soils, the greater the elevation, the more stunted do the plants become, until at length they are no longer capable of perfecting their seeds, or even of producing flowers, which happens to Empetrum nigrum and Vaccinium myrtillus, upon the upper parts of the Braemar mountains.

With respect to luxuriancy of vegetation, that sort of peat produces the most thriving plants which is moderately compact, moderately dry, and not more than 1000 feet above the level of the sea. In the low moors, the heath is less luxuriant than on the declivities of hills But there the mosses, Scirpi and Carices are more abundant and more luxuriant. I have seen very compact peat, at a considerable elevation, produce very fine pasturage, consisting almost exclusively of soft grasses, with some Carices. This is the case, for example, on the farms of Big and Little Scarista, in Harris, immediately behind the dikes separating the infield from the moorlands, and reaching to a considerable distance from them. But it is the dung of the cattle, and also the tramping of animals and men, that seem to have produced this beneficial effect. Very spongy peat is generally covered with Sphagna and Carices; compact peat, with heaths and hard grasses, together with Melica cœrulea, Sesleria cœrulea, and Aira flexuosa.

The plants mentioned are the chief of those peculiar to peat soil. There is, however, found in it a multitude of others not peculiar, such as Euphrasia officinalis, Parnassia palustris, Rhinanthus Crista-galli, Juncus conglomeratus and effusus, and Galium uliginosum. Lakes, with peat banks, produce the same plants as lakes with muddy shores: Carex riparia, Equisetum palustre and limosum, Scirpus lacustris and palustris, Menyanthes trifoliata, Ranunculus flammula; and, in the peat bottoms of lakes, grow also the Nymphæa and Nuphar, the Potamogetons and Myriophylla of mud bottoms. There are numerous other cases in which peat produces the same plants as other soils. All these depend upon the existence of some circumstance that has more influence upon the vegetation than the nature of the soil ordinarily has.

Hitherto no soil that we have examined has heen found to produce plants peculiar to itself, excepting sand and peat; and these two soils, so different from each other in their mechanical and chemical nature, also form a striking contrast in respect to the plants growing upon them, each being characterized by a vegetation differing in aspect and qualities from the other, and scarcely agreeing in any one circumstance.

We come now to consider those compound soils which are distinguished by their principal ingredient. Each of these, it is obvious, must possess a great number of varieties, according as the chief ingredient unites itself to one or other of the several species of simple soils. Thus pebbles may be mixed with sand, with gravel, or with clay.

9. *Plants Growing in Pebbly Soil.*—This sort of soil is not of very rare occurrence, being found in many places in the vicinity of flat shores,—along the course of large rivers,—and in plains, whether inland or not, of greater or less extent. When on the sea-shore, it produces the same maritime plants, in general, which have already been enumerated under the heads of pebbles, gravel, and sand. When mixed with drifting sand, as on the east coast of the Island of Pabbay, it scarcely produces any vegetation at all,—the only species that seem to hold a footing there being Agrostis vulgaris, Rumex crispus, Potentilla anserina, and a few others with long roots; together with straggling individuals of Cakile maritima and Arenaria peploides. In the vicinity of springs, however, where the sand is fixed, it harbours many aquatic gramina, which thrive pretty well. In the valleys or basins along the course of rivers, the pebbly soil that occurs is gene-

rally mixed with gravel and clay; and its vegetation consists of ordinary pasture plants, such as form the bulk of the vegetation of Scotland, without the occurrence of any that could be said to be in the slightest degree characteristic. The vegetation in such soils is generally scanty and stunted.

10. *Plants growing in Gravelly Soil.*—The vegetation of this description of soil differs little from that of the last. It is soil of little comparative importance, for it does not seem to exist extensively at the surface, the greatest tracts of it that I am acquainted with, such as Drymen Moor, being covered with a surface layer of peat.

11. *Plants growing in Sandy Soil.*—The sand of the seashore is driven inland by the winds, where it forms, in depositing, a more or less smooth surface. level or sloping, according to the nature of the ground. This soil becoming fixed by the gradual increase of its vegetation, a verdant turf is formed upon it. The decomposition of these vegetables forms, in time, a surface layer of a sort of soil, consisting partly of vegetable matter, but still chiefly of sand. If we examine this soil, along the western coasts of the outer Hebrides, we find that it is characterized by a vegetation peculiarly rich, both as to variety and luxuriance. The sandy pastures of these islands are decorated with the most lively and varied colours, during the months of June, July and August; and at that season, what appeared in winter a barren and dreary tract, is converted into fertile and pleasant pasture. Here the peculiar vegetation of loose and pure sand has, in a great measure, ceased. To prevent any vagueness on this subject, I shall enumerate the species which I have observed in a particular spot, and which will present a very accurate idea of the vegetation in general of the west coast of the Outer Hebrides. The spot chosen is the sandy ground, extending from the chapel to the ford of North Town in Harris. Perhaps the most striking, and certainly the most abundant and luxuriant species that occurs in this tract, is Daucus Carota. The

basis of the vegetation, however, is formed of the gramineæ and leguminosæ: Festuca duriuscula, F. ovina, Agrostis vulgaris, Aira cristata, Cynosurus cristatus, Poa annua, P. compressa, P. pratensis, Holcus lanatus, Lolium perenne, Bromus mollis; Lotus corniculatus, Anthyllis vulneraria, Vicia Cracca, V. sepium, Lathyrus pratensis, Trifolium pratense, T. repens, T. minus, T. procumbens. With these is intermixed a multitude of other plants of various families: Euphrasia officinalis, Thymus serpyllum, Bellis perennis, Ranunculus repens, R. bulbosus, R. acris, Apargia autumnalis, Senecio Jacobæa, Hieracium pilosella, Plantago lanceolata, P. media, Orchis latifolia, Carex arenaria, Satyrium viride, Draba verna, Primula vulgaris, Thalictrum minus. Tufts of Arundo arenaria also occur here and there. The continuity of the vegetation is completed by a rather plentiful intermixture of mosses, together with a few lichens and fungi. Such is the vegetation in dry places. In low spots, where pools are formed in winter, and along the course of the brooks, there is abundance of Iris pseudacorus. In the latter places, also, many aquatic grasses appear, such as Poa fluitans, Agrostis stolonifera, Agrostis alba, together with Comarum palustre, Ranunculus acris, Juncus cæspitosus, Juncus bufonius, J. conglomeratus, J. effusus, Orchis maculata, Primula vulgaris, and several small willows. This sort of soil, in short, forms the best pasture ground of the Hebrides. The gramineæ and leguminosæ always form the riches of any pasture; and, where these predominate, as in the present case, over the other herbage, the vegetation is peculiarly valuable.

If we now examine the same sort of soil along the eastern coast of Scotland, and select for the purpose, the tract extending from Tarbet Hill to the Mouth of the Don, in Aberdeenshire, we find, in general, the same species as its inhabitants. But here there is in most places a decided inferiority; the most striking feature that presents itself is the thickets of

Ulex europæus, a plant too well known to require any details as to its nature and mode of growth. In the second place, the Daucus Carota has disappeared, although it is abundant in similar situations in other parts of the coast. Still the vegetation is essentially the same; and, were it not for the Ulex, would present the same general appearance. It is, however, much less luxuriant than on the west coast, as well as duller in its appearance; for the leguminosæ are much sparser, and the beautiful flowers of Orchis latifolia are scarcely at all to be seen. The whole aspect of the vegetation, however, to a superficial observer, seems to be entirely changed by the presence of the Ulex, which, occupying whole tracts in continuance, seems to choke up the more useful vegetables. Fortunately for the west coast of the middle and northern divisions of Scotland, as well as the whole of the Outer and most of the Inner Hebrides, this noxious plant has not yet extended there, nor have I observed a single specimen of either it or Genista scoparia,—a plant which also forms a characteristic feature of the vegetation of the low country and south of Scotland, in any part of these districts or islands that I have visited. Thus, proceeding from the Crinan Canal, along the shores of Loch Fyne, by Inverary and Cairndow; from thence, up Glenkinglass and down Glencroe,—the first whin and broom specimens that occur are upon the banks of Loch Long. On the route from Skye to Inverness, by Contin, we pass the braes of Loch Carron long before we see them, although in the Black Isle, as it is called they become very abundant. And thus, finally, from Barray Head to Stornoway in Lewis, there is not a single wild plant of these species, although at Rodell in Harris, there is a hedge of large whins planted by the grandfather of the present proprietor; and near Stornoway, another hedge of broom, planted by a farmer of the name of Sinclair, originally from the district between Inverness and Nairn. Even these individuals, fostered and encouraged as they have been, while they have attained the most respectable dimensions, have yet never propagated, but remain by themselves, unwelcome visitants in a strange land.

Behind this region of sandy soil, we find, in peat districts, a soil composed of an intermixture of peat and sand; or, speaking more correctly, a soil at first similar to the last, but gradually diminishing in thickness towards the land, covers the subsoil of peat to no great height, and, at last, by the trampling of cattle and men, and other causes, becomes intermixed with it, and then ceases. About the middle of this region, the aspect of vegetation is considerably different from that of sandy soil, or of pure peat. The varied colours of the former, and the heaths of the latter, have equally, in a great measure, disappeared; and the characteristic herbage of this soil consists chiefly of Carices, Junci, Scirpi and Gramineæ, with some Orchideæ. It is to be seen to a considerable extent along the whole western shore of the Outer Hebrides, and more especially in the Islands of Benbecula and South Uist. It produces excellent pasture for both cows and sheep, more especially the latter.

In districts which are not essentially composed of peat, the sand intermingling with the meagre soil of the pasture grounds, produces a vegetation, consisting of a mixture of all sorts of plants that grow in open and exposed places. There is nothing, in short, in this vegetation, that characterises it as distinct from ordinary pasturage. It varies, of course, as to luxuriance, as well as in regard to the species growing in such soil, according to the nature of the subsoil, and the varying quantity of water retained in the soil. The great mass consists generally of Gramineæ, Agrostides, Airæ, Festucæ, &c; Carices, Leguminosæ, Euphrasia officinalis, Bartsia odontites, Scabiosa succisa (along the west coast, but seldom on the east), Polygala vulgaris, Bellis perennis, &c.

12. *Plants growing in Gritty Soil.*—The vegetation of this

soil is altogether similar to that of grit, and therefore requires no elucidation.

13. *Plants growing in Clayey Soil.*—This species of soil exhibits considerable variety, and is also extensively diffused, and, in some places, occupies extensive districts. In the course of large rivers toward their mouth, or rather in the great valleys, through which such rivers take their course, we frequently find vast deposits of a sort of clay of a greenish-grey colour, intermingled with sand, gravel, and pebbles. This clay, however, seldom exists at the surface, but is covered sometimes with a layer of vegetable soil, sometimes with peat, the latter often of great depth: and the former, by the action of the plough, intermixed with the more pure clay from beneath. This clay, from its occurring, in what with us are termed carses, is named carse-clay. Fine examples of it are exhibited in the Carse of Gowrie, in Strathearn, and in the district about Stirling. Where this carse-clay has been long under cultivation, as from Dundee to Perth, or in the Lower Forth District, it affords, as is well known, a soil highly favourable to the hopes of the husbandman. And even where it has been but lately laid bare, the artificial vegetation produced upon it is of excellent quality, as is the case with the uncovered part of Blair Drummond Moss. Soil of this kind is generally under cultivation with us, and has been so from time immemorial, or from the period at which it was first reclaimed. It, therefore, furnishes few opportunities of observing its natural vegetation. In such places, however, as it has presented itself to my observation, I have not been able to detect any peculiarity of aspect or quality in its vegetation different from ordinary vegetable, or gravelly, or clayey soil, under similar circumstances. Thus, the banks of the Forth, between Alloa and Stirling, produce the same Arundo phragmites as the banks of Duddingston Loch,—the same Poa aquatica as the Water of Leith, near Edinburgh, —the same aquatic and marine plants intermixed,

as the Dee below the bridge. The patches and edgings of pasture grounds about Kinnoul produce the ordinary pasture plants that occur in all parts of Scotland.

There is a species of clayey soil that occurs in primitive districts upon the declivities of mountains, and which differs from carse clay, among other circumstances, in being stiffer, of a greener colour, more intermixed with gravel and grit, and less so with fine sand; the Glen of Rodill in Harris furnishes an example of it. Here the natural vegetation differs in nothing from that of other places in the same and in other districts, where the soil is totally different. In short, I know no plant peculiar to clay soil, nor is even Tussilago Farfara of this description, for I have often seen it, in its natural situation, by running water, in almost every variety of soil, excepting peat, although it certainly is more abundant in clayey, or rather in gravelly soil mixed with clay, than any other.

The various substances comprehended under the general names of clay, marl and loam, may all, under the point of view to which our attention is here directed, be considered as belonging to clayey soil. Thus the siliceous marl or clay mixed with particles of siliceous matter, of the subappenine hills, and the calcareous marl, or clay mixed with a small proportion of calcareous matter, which covers the gypsum deposits of the neighbourhood of Paris, are strictly referable to the present division. The latter, like our ordinary clay, which is plentifully intermixed with fine sand, is employed in the manufacture of tiles and bricks. These substances possess a high degree of interest, on account of their importance in the economy of nature, entering largely into the composition of many soils, covering great tracts of country in this state, and existing in extensive and numerous substrata; and from the various uses to which they are applied in the arts, and especially in agriculture. If calcareous marls exist in Scotland as a soil, that is at the surface, I have had no opportunity of examining them; but it is probable their vegetation is the same as that of ordinary clayey soil; and as to the siliceous varieties, being essential in an agricultural point of view, the same as carse clay, they must necessarily produce the same plants.

14. *Plants growing in Peaty Soil.*—There are few cases in which peat occurs actually intermixed with other matter. Drift sand lies over it, but does not in the natural state incorporate itself with it. The same may be said of the debris of overhanging rocks or mountains. It is only the action of the plough or of similar implements of agriculture that produces a peaty soil, by bringing up a portion of the substratum of sand or gravel, when it is close upon the surface, as in many parts of Murray and Nairnshires, and in the Hebrides. Soils of this description, when left again to themselves, produce a poor and scanty vegetation, consisting chiefly of Airæ, Festucæ, Rumex Acetosella, Bellis perennis, Polygonum aviculare, Lotus corniculatus, and various mosses.

15. *Plants of Vegetable Soil.*—This, in an agricultural point of view, is perhaps the most important of all soils. It is pretty extensively diffused in this country, even in the natural state, and has been still more extended by the operations of agriculture. A general definition of vegetable soil may be made as follows. Soil of a dark colour, more or less friable when dry, not adhesive, nor exhibiting indications of peat, by having dark coloured fragments intermixed, either hard when dry, or of a fibrous texture, with a basis of any simple soil, or of several conjoined.

On taking a general view of vegetable soil, one would be apt to infer that it assuredly possesses a multitude of plants peculiar to itself. Of those species that appear to characterize such soil, we may enumerate the following: Urtica dioica, Urtica urens, Sonchus oleraceus, Sonchus arvensis, Spergula arvensis, Rumex obtusifolius, Polygonum aviculare, P. convolvulus, Stellaria media, Matricaria chamomilla, Plantago major, Chrysanthemum leucanthemum, Poa annua, P. pratensis, Artemisia vulgaris, Tanacetum vulgare, Trifolium repens, Lamium album, L. purpureum, Galeopsis versicolor. But on more minute examination, we find that many or most of these are rather plants of peculiar situations, than plants of vegetable soil, growing in certain places or stations whatever the soil of those places may be. And in reality I do not find a single species that I could name as peculiar to this soil. Let us take one or two, for example, that seem most characteristic. Poa annua grows abundantly in vegetable soil, in gardens, about houses, by waysides, and in pastures; but it is also to be met with in such, and other places, in sandy, gravelly, clayey and many other soils. Urtica dioica and Rumex obtusifolius, are found about houses in every soil. Trifolium repens occurs equally in the richest and in the most meagre soil, in vegetable soil and in gravel. There are undoubtedly universal inmates of vegetable soil, both in a cultivated and uncultivated state; but of plants peculiar to such soil, there seems to be none. In the vicinity of houses vegetable soil produces Urtica dioica, Rumex obtusifolius, Artemisia vulgaris, Tanacetum vulgare, Chenopodium Bonus Henricus; and, as these plants grow equally in any soil in such places, they are rather to be considered as plants peculiar to the vicinity of the habitation of man. It would be easy to furnish a very extended list of plants proving the general axiom already stated, that the plants which appear abundantly in vegetable soil, are rather such as are peculiar to the positions in which they occur, than to that soil. Thus, to take an example from the vicinity of Edinburgh: In hedges we observe most commonly Triticum repens, Agrostis vulgaris, Æthusa Cynapium, Galeopsis versicolor, Dactylis glomerata; by ditches Epilobium hirsutum, E. parviflorum, Agrostis vulgaris, Poa trivialis, Tussilago Farfara; in ditches, Nasturtium officinale, Poa fluitans, P. trivialis; about houses, Urtica dioica, Rumex crispus, R. obtusifolius;

by roads, Plantago major, Matricaria Chamomilla; by the margins of cornfields, Plantago major, Chenopodium urbicum, Bellis perennis; among corn, Papaver Rheas, Urtica urens, Sinapis arvenis; by rivers or streams, Tussilago Petasites, Lychnis dioica, Geum rivale; by lakes, Iris pseudacorus, Ranunculus Flammula, Lychnis Flos-cuculi, Cardamine pratensis; in the lakes and rivers, Poa aquatica, Sparganium ramosum, Scirpus palustris, Sc.lacustris, Equisetum limosum, Potamogeton fluitans. But these plants are by no means peculiar tô such soil; they occur in almost all soils, when placed under similar circumstances. I have never observed vegetable soil either on the sea shore or on the summits of high mountains, so that in this countrv at least, it has neither maritime nor alpine plants. In all intermediate stations, difference of altitude produces difference of vegetation, scarcely even of luxuriance of vegetation.

To conclude this brief examination of soils with reference to the plants produced by them, the great mass of vegetation in Scotland is diffused over every variety of soil that is to be found in the country, with the exception of peat and sand. In none of the other soils can we safely affirm that we have seen any plants absolutely peculiar. We now, however, proceed to another division, the observations contained in which will in some measure explain why this should be the case.

V. *General inferences deduced from the observations contained in the two foregoing divisions, comprehending the indications that may be formed of the nature and quantities of soils and subsoils, from the plants growing upon them.*

From what we know of the constitution of the world in general, and from what we have observed of Scotland in particular, we are led to infer, in the *first* place, that soil has little influence upon the nature of the vegetation, this being determined chiefly by climate, and modified by various circumstances having no connection with the nature of the soil; but that soil has a very considerable influence upon the quality of this vegetation, this influence depending more upon its degree of fixedness, tenacity, and capability of imbibing and retaining moisture, than upon its chemical properties.

Of the soils which occur in Scotland, sand and peat are those which are the most distinctly characterized by the plants that grow upon them. With them, therefore, we may commence our indications.

Loose sand requires no indications by vegetables, its nature being rendered too obvious by other circumstances. Luxuriant tufts of Arundo arenaria, either by itself, or mixed with Triticum junceum, Galium verum, and some other vegetables, frequently occur in this soil.

Calcareous sand and siliceous sand are not distinguished apart by any peculiar plants. They may, however, be readily distinguished by simple inspection.

Intermixture of pasture plants, and especially Galium verum, Achillæa millefolium, and grasses, with Arundo arenaria, indicate that the sand is more or less fixed, and that it is tolerably well secured against drifting.

The existence of peat is invariably indicated by Calluna vulgaris, Erica cinerea, E. tetralix. It is to be suspected also wherever Myrica gale, Droseræ, Eriophora, numerous Carices, and Melica cœrulea appear.

Soft, friable, scaly or laminar peat, is indicated by a vegetation consisting chiefly of Calluna vulgaris, Erica cinerea, Melica cœrulea, intermixed with Carices, Junci, Scirpi, Mosses, and Lichens.

Fibrous, tenacious, spongy peat, is indicated by a vegetation consisting chiefly of Cyperaceæ, Carices, Scirpi, and Junci, especially Juncus cæspitosus and Eriophorum vaginatum, with comparatively little heath.

Compact, brittle, hard peat, is indicated, chiefly on declivities, and in elevated situations, by a vegetation consisting in a great part of Gramineæ, such as Melica cœrulea, Aira flexuosa, together with Cyperaceæ and heath.

The softish friable peat in which remains of ligneous vegetables occur, is not indicated by any peculiarity of vegetation differing from that indicative of the first kind of peat mentioned. It is almost always to be found in low and level places, and is frequently swampy at the surface, with great tufts or islets, covered with heath.

Calluna vulgaris or Erica cinerea, when luxuriant and close, indicate a gravelly soil at no great depth. Pinus sylvestris growing in peat indicates that it is thin, and that the subsoil is sandy or gravelly. Scirpi, Carices, and Eriophora, thriving in peat, indicate an abundant supply of moisture, owing either to a subsoil of clay or solid rock. On the contrary, a vegetation stunted, and liable to be burnt up in dry weather, indicates, in general, dryness arising from a subsoil of sand. The cessation of Erica and Calluna upon mountains, indicates either the cessation of peat soil, or approximation to the line of snow.

On open heaths, Trientalis europæa and Anemone nemorosa indicate great dryness, and manifest a disposition favourable to the growth of Pinus sylvestris, if planted on them. Heath overgrown or much intermixed with lichens, indicates too great an elevation for the successful cultivation of corn. The same indication is made by the existence of alpine plants, such as Saxifraga stellaris, Veronica alpina, Thalictrum alpinum, &c. Great profusion and luxuriance of Scirpus cæspitosus in low heaths, indicate that, although excellent for summer pasturage, they are unfit for wintering, from their great wetness. The existence of any other tree than Pinus sylvestris in peat soil, shews that the subsoil comes very near the surface.

With respect to cultivation of peat soil, some indications are also furnished by the plants growing in it. Peat, of which the surface is even, and continuously covered with Calluna or

Erica, is in general capable of being taken in, because the gravel comes so near the surface that it may be reached by the plough. On the other hand, low tracts of peat, with great tufts of heath, separated by bogs, are incapable of being reclaimed, without previous draining, and, after all, the peat is too deep to form a tolerable soil. Spongy, fibrous peat is the most intractable of all the varieties, because, from its tenacity, it cannot be made to mingle with gravel or sand.

The great mass of vegetation, or, as it may be called, the standard vegetation of the country, being diffused over every sort of soil, sandy, gravelly, gritty, clayey or vegetable, no particular indications are afforded by it of the nature of the soil, unless with respect to its luxuriance, which yet depends upon other circumstances, more than upon the quality of the soil.

Trifolia, Viciæ, Lathyrus pratensis, mixed with grasses, forming the principal part of the vegetation, and growing luxuriantly, indicate a good vegetable soil, well supplied with moisture.

Abundance of Thymus serpyllum indicates not so much any particular soil, as dryness of soil, or great thinness. Senecio Jacobæa, in general, indicates a good depth of good soil. Linum catharticum, Thymus serpyllum, Apargia autumnalis, Hieracium pilosella, indicate dry, if not gravelly or sandy soil, in pasture grounds. Iris pseudacorus, Juncus acutiflorus, Cardamine pratensis, and Lychnis Flos-cuculi, in such, indicate a good soil, with a plentiful, or more frequently an overabundant, supply of moisture. In pasture-grounds, in general, the existence of Poa trivialis, Triticum repens, Potentilla anserina, Plantago lanceolata, P. media, Senecio Jacobæa, indicate a soil of good quality, capable of being cultivated with advantage.

A stunted, and, in hot weather, burnt up herbage, indicates the approximation of the rock to the surface, or extreme dryness of soil. Sandy pasture grounds are always characterized by a peculiar fineness of vegetation, producing a comparatively large portion of the most nutritious species, excepting when furze or broom has got into them, in which case these plants frequently banish or choke up the more useful kinds. An intermixture, however small, of Erica or Calluna, with pasture plants, indicates that the soil is more or less peaty; Orchideæ, and especially Orchis maculata, abundant in pasture grounds, affords the same indication. Pteris aquilina, in such grounds, especially when the other vegetation consists chiefly of grasses, affords a very favourable idea of the soil, which has commonly a large proportion of vegetable earth in it, where this plant grows luxuriantly.

Gravelly or gritty soil is indicated by the poverty of the vegetation. Aira caryophyllæa, A. præcox, Rumex acetosella, are among the ordinary inmates of such soil. When intermixed with clay, the vegetation is scanty, and consists chiefly of grasses.

Clayey soil is indicated by the depressed and straggling nature of the vegetation, which consists chiefly of grasses, of the genera Poa, Agrostis and Festuca. By streams, a great profusion of Tussilago Farfara generally indicates a clayey soil, and of T. Petasites, a deep rich vegetable soil.

In the natural uncultivated state, vegetable soil is indicated, near the habitation of man, by Urtica dioica, Rumex obtusifolius, Artemisia vulgaris, Poa annua, P. pratensis, and Tanacetum vulgare, although, nevertheless, all these species may be found so situated in many varieties of soil; in pastures, by Trifolium repens, T. pratense, Poa annua, Plantago media, P. lanceolata, Vicia Cracca, Bellis perennis.

With respect to luxuriance, the matter is simply thus: neither the chemical nor the mechanical nature of the soil influences the development of plants, further than as they contain the quantity of moisture favourable to particular species or genera; and it can only be by a very complex view of nature that one can attain a knowledge of the suitableness of a soil for a particular species of vegetable.

Some striking general indications, nevertheless, present themselves to us in nature Thus, if, while traversing an extended heath, we observe at a distance a spot covered with fresh verdure, we infer that the soil there is certainly not peat; and if, on approaching it, we see Poæ, Viciæ, and other plants usually found in rich pasture, we infer that the soil is vegetable, and so of other soils. If, on the other hand, in a rich country, we see tracts, whether of hill or plain, covered with a brown vegetation, which we know to be heath, we infer that the soil is peat. Still, even among these general appearances, there are few that have direct reference to soil. Thus, on seeing a long line of trees, which we know by their physiognomy to be alders or willows, we infer that a river flows beside them, but we can make no inference with respect to the soil. And thus, were it possible that we should be led blindfolded to a spot, in which we should open our eyes upon a rivulet, margined with bright green moss, among which Saxifraga stellaris, Alchemilla alpina, Silene acaulis, appeared here and there, we might assuredly pronounce ourselves in an alpine region; but what the peculiar soil of the spot might be, we would require to remove the turf to discover, and thus trust to the colour, texture, adhesion, and other qualities of the soil itself for a disclosure of its nature, rather than to any thing growing upon its surface.

Thus we see that Nature, simple in her grand plans, yet complex even to infinity in her details of execution, presents nothing of which we can acquire a tolerable knowledge, by viewing it on one side only, or which the mind can grasp, by employing a single principal or pervading idea for that purpose. The grand principle of vegetation is simple in its design; but view it in detail, and its complication astonishes and bewilders. To become the abode of animals, it was necessary that the earth should be covered with vegetables; but from the cedar of Lebanon, to the small plant (whatever that may be) that grows on the wall; from the magnificent Jagua of tropical America, to the diminutive Radiola of northern Europe, not to take other examples still more striking, how multiplied the proportions, the forms, the colours, the qualities of all kinds, and how different the circumstances! It is the same sun that calls forth, and, when thus elicited, gives vigour to the vegetation, the same earth that supports it, the same moisture that swells its vessels, the same air that furnishes the medium in which it lives; but amid all this singleness of general, how multiple the variations of partial or constituent causes, and how infinitely diversified their results!

APPENDIX,

CONSISTING OF THE LINNEAN AND COMMON NAMES OF THE PLANTS MENTIONED IN THE PRECEDING ESSAY.

Linnean Names.	*English Names.*
ACHILLÆA Millefolium,	MILFOIL, common yarrow
A. Ptarmica,	Sneeze-wort
Æthusa Cynapium,	Fool's parsley
Ægopodium podagraria,	Gout weed
Agrostemma Githago,	Corn cockle
Agrostides,	Bent grasses
Agrostis alba,	White bent-grass
A. stolonifera,	Creeping bent-grass
Airæ,	Hair grasses
Aira caryophyllæa,	Silvery hair-grass
A. præcox,	Early hair-grass
A. cristata,	Crested hair-grass
A. flexuosa,	Waved hair-grass
Alchemilla alpina,	Alpine lady's mantle
A. vulgaris,	Common lady's mantle
Algæ,	Sea-weeds, &c.
Aloe,	Aloe
Alnus glutinosa,	Alder
Alismaceæ,	Plants resembling water plantain
Alisma Plantago	Water plantain

Linnean Names.	*English Names.*
Anagallis arvensis,	Scarlet pimpernel
Anemone nemorosa,	Wood anemone
Apargia autumnalis,	Autumnal apargia
Aroideæ,	Plants resembling wake-robin
Arctium Lappa,	Burdock
Arenaria serpyllifolia,	Thyme-leaved sandwort
A. peploides,	Thick-leaved sea sandwort
Arundo arenaria,	Sea reed, sea bent
A. Phragmites,	Greet reed
Artemisia vulgaris,	Mugwort
Aspidia,	Lady ferns
Asplenia,	Spleenwort
Asphodeleæ,	Plants resembling hyacinths
Atriplex patula	Spreading orache
A. laciniata,	Frosted sea-orache
Bœomyces roseus,	Flesh-coloured bœomyces
Bartsia Odontites,	Red bartsia
Bellis perennis,	Common daisy
Blechnum boreale,	Northern blechnum
Botrychium Lunaria	Moonwort
Bromus mollis	Soft brome grass
Cakile maritima,	Sea rocket
Calluna vulgaris,	Common heath, or ling
Campanula rotundifolia,	Common bellflower
Carex arenaria,	Sand carex
C. riparia,	Great common carex
C. panicea,	Pink-leaved carex
Carices,	Segs
Cardamine pratensis,	Lady's smock
Centaurium nigrum,	Black centaury, or knapweed
C. Cyanus,	Blue bottle, or blue bonnet
Cetraria islandica,	Iceland moss
Chenopodeæ,	Plants resembling goosefoot
Chenopodium album,	White goosefoot
C. urbicum,	Upright goosefoot
C. bonus-henricus,	Perennial goosefoot, Good King Henry
C. maritimum,	Sea-side goosefoot
Cenomycæ,	Cenomycæ (a genus of Lichens)
Chrysanthemum leucanthemum,	Great ox-eye
C. segetum,	Corn marigold
Cnicus arvensis,	Corn thistle
C. lanceolatus,	Common large thistle

Linnean Names.	*English Names.*
Comarum palustre,	Marsh cinquefoil
Dactylis glomerata	Rough cock's-foot grass
Confervæ,	Confervæ
Coniferæ,	Trees allied to the fir
Corylaceæ,	Trees allied to the hazel
Cynosurus cristatus,	Crested dog's-tail grass
Cyperaceæ,	Hard or moor grasses
Daucus Carota,	Wild carrot
Draba verna,	Common whitlow grass
Drosera rotundifolia,	Round-leaved sun-dew
D. longifolia,	Long-leaved sun-dew
Empetrum nigrum,	Crowberry
Epilobium hirsutum,	Great hairy willow-herb
E. parviflorum,	Small-flowered hoary willow-herb
E. alsinifolium,	Chickweed-leaved willow-herb
Equiseta,	Horsetails, Paddock-pipes
Equisetaceæ,	Plants resembling horsetail
Equisetum palustre,	Marsh horsetail
E. limosum,	Smooth naked horsetail
Erica cinerea,	Fine-leaved heath
E. tetralix,	Cross-leaved heath
Eriophora,	Cotton-grasses
Eriophorum vaginatum,	Hare's-tail cotton-grass
E. polystachion,	Broad-leaved cotton-grass
Eryngium maritimum,	Sea holly
Euphrasia officinalis,	Eyebright
Euphorbiaceæ,	Plants resembling spurge
Festuca duriuscula,	Hard fescue-grass
F. ovina,	Sheep's fescue
Festucæ,	Fescue-grasses
Filices,	Ferns
Fluviales,	Water plants
Fumaria officinalis,	Common fumitory
Fuci,	Sea-weeds,
Fungi,	Mushrooms, &c.
Galeopsis versicolor,	Large-flowered hemp-nettle
G. Tetrahit,	Common hemp-nettle
Galium boreale,	Cross-leaved bedstraw
Galium uliginosum,	Rough marsh bedstraw
G. verum,	Hollow bedstraw.
Genista scoparia,	Broom
Geum rivale,	Water avens
G. urbanum,	Common avens

Linnean Names.	*English Names.*
Glaux maritima,	Black saltwort
Gnaphalium supinum,	Dwarf cudweed
Gramineæ,	Grasses
Hieracium murorum,	Wall hawkweed
H. pilosella,	Mouse-ear hawkweed
Holcus lanatus,	Meadow soft-grass
H. mollis,	Creeping soft-grass
Hydrocharideæ,	Plants allied to Hydrocharis
Hypericum pulchrum,	St John's wort
Iris pseudacorus,	Yellow iris
Junceæ,	Plants resembling rushes
Juncus effusus,	Soft rush
J. conglomeratus,	Round-headed rush
J. acutiflorus,	Sharp-flowered rush
J. bufonius,	Toad rush
J. trifidus,	Three-leaved rush
Juncagineæ,	Arrow-grasses, &c.
Jungermannia scalaris,	
J. epiphyllum,	
Lamium album,	White dead nettle
L. purpureum,	Purple dead nettle
Lathyrus pratensis,	Meadow vetchling
Leguminosæ,	Plants resembling vetches
Lecanora tartarea,	White crustaceous lichen
L. parellus,	Litmus lichen
Lichenes,	Lichens
Linum catharticum,	Purging flax
Littorella lacustris,	Plantain shore-weed
Lotus corniculatus,	Birdsfoot clover
Lolium perenne,	Ryegrass
Lobelia Dortmanna,	Water lobelia
Lychnis dioica,	Common purple lychnis
L. Flos-cuculi,	Ragged robin
Lycopodium Selago,	Fir club moss
Lycopodineæ,	Club-mosses
Matricaria chamomilla,	Wild chamomile
Melica cœrulea,	Purple melic grass
Menyanthes trifoliata,	Bog-bean, Marsh trefoil
Mimosa,	Mimosa
Musci,	Mosses
Myrica gale,	Sweet gale
Myriophyllum spicatum,	Spiked water-milfoil
Nardus stricta,	Mat-grass

Linnean Names.	*English Names.*
Nasturtium officinale,	Water-cress
Nuphar lutea,	Yellow water-lily
Nymphœa alba,	White water-lily
Orchideæ,	Plants resembling orchis
Orchis maculata,	Spotted-leaved orchis
O. latifolia,	Broad-leaved orchis
Orobus tuberosus,	Tuberous or common heathpea
Osmunda regalis,	Flowering fern
Oxyria reniformis,	Kidney-leaved oxyria
Parmelia parietina,	Common yellow lichen
P. saxatilis,	Common brown lichen
Parnassia palustris,	Grass of Parnassus
Papaver dubium,	Long-smooth-headed poppy
P. Rhæas,	Common red poppy
Pedicularis sylvatica,	Wood lousewort
P. palustris,	Marsh lousewort
Pinguicula vulgaris,	Common butterwort
Pinus sylvestris,	Common fir
Plantago major,	Greater plantain
P. media	Hoary plantain
P. lanceolata,	Ribwort
P. maritima,	Sea plantain
Poa trivialis,	Common meadow-grass
P. annua,	Annual meadow-grass
P. compressa,	Compressed meadow-grass
P. aquatica,	Reed meadow-grass
P. fluitans,	Floating meadowgrass
Poa pratensis,	Smooth-stalked meadow-grass
Poæ,	Soft or meadow-grasses
Potamogeton natans,	Broad-leaved pond-weed
P. fluitans,	Long-leaved floating pond-weed
Polygonum viviparum,	Viviparous bistort
P. convolvulus,	Climbing buck-wheat
P. aviculare,	Knot-grass
Polypodium vulgare,	Common polypody
Potentilla anserina,	Goose-grass
Primula vulgaris,	Primrose
Prunella vulgaris,	Self-heal
Pteris aquilina,	Common fern or brake
P. crispa,	Curled stone fern
Pulmonaria maritima,	Sea lungwort
Raphanus maritimus,	Sea radish
R. Raphanistrum,	Charlock

Linnean Names.	*English Names.*
Radiola millegrana,	All-seed
Ranunculus repens,	Creeping crowfoot
R. acris,	Bitter crowfoot
R. Lingua,	Great spearwort
R. Flammula,	Lesser spearwort
R. aquatilis,	Water crowfoot
R. bulbosus,	Bulbous buttercup
Rhinanthus Crista-galli,	Cock's comb, or yellow rattle
Rhodiola rosea,	Rose-root
Rotbollia incurvata,	Sea hard-grass
Rubus fruticosus,	Common bramble
Rumex acetosa,	Common sorrel
R. acetosella,	Sheep's sorrel
R. crispus,	Curled-leaved dock
R. obtusifolius,	Common dock
Salices,	Willows
Salicinæ,	Plants resembling willows
Salix herbacea,	Small alpine willow
Salsola Kali,	Glasswort
Satyrium viride,	Green satyrium
Scabiosa succisa,	Devil's-bit scabious
Scirpi,	Clubrushes
Scirpus cæspitosus,	Scaly-stalked clubrush
S. lacustris,	Bulrush
S. palustris,	Marsh clubrush
Saxifraga stellaris,	Starry saxifrage
S. aizoides,	Yellow saxifrage
Schæni,	Bog-rushes
Sedum sexangulare,	Large yellow stonecrop
Senecio Jacobæa,	Common ragwort
S. vulgaris,	Common groundsel
Sesleria cœrulea,	Blue moor-grass
Silene maritima,	Seaside campion
Sinapis arvensis,	Field mustard
Sonchus arvensis,	Corn sow-thistle
S. oleraceus,	Common sow-thistle
Spergula arvensis,	Corn spurrey
Sphagna,	Marsh mosses
Sparganium ramosum,	Branched bur-reed
Statice Armeria,	Seaside daisy, thrift
Stellaria media,	Common chickweed
Stereocaulon Paschale.	A species of lichen
Sticta scrobiculata,	Lungwort

Linnean Names.	*English Names.*
Teesdalia nudicaulis,	Naked-stalked teesdalia
Tanacetum vulgare,	Common tansy
Thlaspi Bursa-pastoris,	Shepherd's purse
Thalictrum alpinum,	Alpine meadow-rue
T. minus,	Common meadow-rue
Thymeleæ,	Daphne, &c.
Thymus serpyllum,	Wild thyme
Tormentilla officinalis,	Common tormentil
Trientalis europæa,	Chickweed winter-green
Trifolia,	Trefoils
Trifolium pratense,	Red clover
T. repens,	White clover
T. procumbens,	Creeping yellow clover
T. minus,	Smaller yellow clover
Triticum repens,	Creeping dogwheat
T. junceum,	Sand wheat-grass
Tussilago Farfara,	Colt's-foot
T. Petasites,	Common butter-bur
Ulex europæus,	Whin, gorse, or furze
Ulmaceæ,	Trees resembling the elm.
Urticeæ,	Plants resembling the nettle.
Urtica urens,	Small nettle
U. dioica,	Common nettle
Vaccinium myrtillus,	Blaeberry, bilberry
Viciæ,	Vetches
Vicia sepium,	Bush vetch
V. Cracca,	Purple meadow vetch
Zostera marina,	Sea-grass.

ESSAY II.—*By* MR ARCHIBALD GORRIE, *Annat Garden, Perthshire.*

BEFORE proceeding to point out the indigenous plants which indicate certain qualities of soil, it may be proper to attempt, as far as the nature of the subject will admit, to classify the different soils to be treated of; and here it will be readily allowed, that any minute analysis of soils would rather tend to perplex than lead to any useful or practical result.

The number of plants which may serve as a test for pointing out the peculiarities of soils is comparatively small; many are found to prosper equally on different soils, and the means which nature employs to cover the surface of our globe with verdure, are so well adapted for accomplishing that purpose, that it affords matter of astonishment to find in the vegetable creation an approximation to locality in certain plants, which may enable us to assign to each its favourite nidus in cultivation, or to distinguish that nidus by their spontaneous growth. Our classification of soils will, therefore, be as simple as the nature of the subject seems to us to demand, and at the same time we trust so explicit as to be easily understood.

I. *Alluvial Soil.*—Under the term Alluvial Soil, we wish to be understood such soil as has been deposited in low situations, by the overflowing of streams from the higher grounds, generally containing a considerable proportion of finely divided vegetable matter, which gives it a dark colour, and produces almost inexhaustible fertility. This kind of soil is found generally by the sides of low winding rivers. We shall, in this division, confine our attention to alluvial soil *recently* deposited; and, in treating of plants, we shall, for the sake of perspicuity, adopt the following arrangement.

PERENNIAL PLANTS.		ELEVATION.	CLIMATE.
Linnean Names.	*English Names.*	Feet	Mean Temp.
Arundo Phragmites	Common reed	0 to 400	48°
Juncus conglomeratus	Round headed rush	0 500	47 30′
Agrostis alba	Fiorin grass	0 1000	46
Poa aquatica	Reed meadow grass	0 500	47 30
Poa fluitans	Floating meadow-grass	0 800	46 30

All these plants, as will be seen by the above table, occupy a considerable range as to elevation, and consequently as to climate. In ascertaining the elevation, any thing like mathematical accuracy cannot be attained. Some plants accommodate themselves to a very extensive range; for instance, the Astragalus uralensis is found on a knoll near the Queen's Ferry, and it is also found on the summit of some of the highest hills in Scotland. In point of latitude, too, the range is still more extensive. In estimating the climate, or, more strictly speaking, the temperature, where they are found in a natural state, we shall suppose the lowest grounds subjected to our research to be the shores of the Frith of Forth, which, according to Leslie, give a mean temperature of 48° 3′ Fahrenheit, at a north latitude of 55° 57′; and assuming that the annual mean temperature diminishes 1° for every * 270 feet of elevation; and taking into account the diminution or increase of temperature, according to the formula of Mayer, for every degree of latitude north or south from the said Frith, we will expect the indulgence of our readers, when, from these data, we attempt to fix the mean temperature of the climate of such plants as we have found by actual observation to occupy higher or lower regions, or as we have found them to predominate to the south or north of the point above alluded to.

Having thus given a specimen of the table, followed with an explanation of the data from which it is formed, we now proceed to remark, that, after rich alluvial soils have been drained and brought under cultivation, the perennial plants disappear, except the Arundo Phragmites, which maintains its ground in deep soils long after they have been subjected to the best culture. The corn crops on such rich soils are generally so luxuriant as to exclude every other plant. Where the culture is indifferent, the Cnicus arvensis (corn thistle), becomes a troublesome weed.

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* In the altitudes afterwards quoted by the author, Professor Leslie, above referred to, proposes to assign 100 yards as an elevation corresponding to 1° Fahrenheit.—Edit.

2. *Clay.*—Under this term may be comprehended that sort of clay soil which forms the greatest proportion of low carse lands; and though, strictly speaking, this is also alluvial, the deposit *is not so recent* as in the first division. The soil has, either by art or accident, been longer in a dry state; and the plants which appear, in its natural state, are more numerous, and indicate the more firm texture of the soil.

SHRUBS.		ELEVATION.	CLIMATE.
Linnean Names.	*English Names.*	Feet.	Mean Temp.
Rosa rubiginosa	Sweet briar	0 to 540	47 °
Alnus glutinosa	Common alder or arn	0 1080	46 °
Salix caprea	Common sallow	0 720	46½
Ulex europaeus	Common furze or whin	40 740	46½
HERBACEOUS PLANTS.			
Spirea Ulmaria	Meadow sweet	20 1000	46
Angelica sylvestris	Wild angelica	0 720	46½
Ranunculus lingua	Great spearwort	20 540	47
Rumex acetosa	Common sorrel	40 1000	46

When such clay soils are subjected to cultivation, the shrubs and herbaceous plants are easily rooted out; and the weeds that appear are either introduced amongst the seed-grain, or amongst the dung.

ANNUAL WEEDS.		ELEVATION.	CLIMATE.
Linnean Names,	*English Names.*	Feet.	Mean Temp.
Rumex obtusifolius	Broad leaved dock	40 to 800	46½°
Senecio vulgaris	Groundsel	40 900	46½
Lapsana communis	Nipple wort	40 800	46½
Agrostemma Githago	Cockle or Pepper	40 540	47
Matricaria chamomilla	Wild chamomile	40 840	46½
Sonchus oleraceus	Common sow thistle	40 900	46½

The agrostemma and wild chamomile are introduced amongst the wheat and grass seeds, and maintain their ground among the subsequent crops.

3. *Yellow Clay and Reddish Rock Marl.*—Under the third division we shall include the poorer clays, including the red or rock marl-clay, often found incumbent on red sandstone rocks, and those yellow ochry clays that are often met with in elevated situations, the same plants being peculiar to both these descriptions of soil.

HERBACEOUS PLANTS.		ELEVATION.	CLIMATE.
Linnean Names.	*English Names.*	Feet.	Mean Temp.
Scrophularia nodosa	Knobby rooted figwort	40 to 800	46½°
Ranunculus acris	Upright meadow crowfoot	20 2000	44
Aira caespitosa	Tufted hair-grass	0 1080	46
Equisetum arvense	Corn horse-tail	40 1000	46
Stachys palustris	Marsh woundwort	40 1000	46

When this description of soil is brought under tillage, the Tussilago Farfara, (common colt's-foot), grows amongst the corn crops, and is eradicated with difficulty when there is any calcareous sand mixed with the clay.

The annual weeds, indicative of such clay-soils, are,

ANNUAL WEEDS.		ELEVATION.	CLIMATE.
Linnean Names.	*English Names.*	Feet.	Mean Temp.
Sinapis arvensis	Wild mustard	100 to 500	47 °
Bartsia Odontites	Red eye-bright	200 to 1000	45½
Polygonum Persicaria	Peach-wort	300 to 1000	45
Polygonum aviculare	Knot grass	200 to 1200	45

4. *Strong Black Loam.*—The natural productions peculiar to strong black loam, incumbent on whinstone or limestone rock, and reposing on a brownish open bottom above that rock, are,

HERBACEOUS PLANTS.		ELEVATION.	CLIMATE.
Linnean Names.	*English Names.*	Feet.	Mean Temp.
Silene inflata	Bladder campion	100 to 800	46½°
Antirrhinum Linaria	Toad-flax	100 1000	46
Scabiosa arvensis	Field scabious	100 1000	46
Centaurea scabiosa	Great knapweed	100 600	47
Polygonum amphibium	Red shanks, Amphibious persicaria	0 1000	46½
Dactylis glomerata	Rough cock's-foot grass	40 200	46⅓

When the rock is near the surface

HERBACEOUS PLANTS.		ELEVATION.	CLIMATE.
Linnean Names.	*English Names.*	Feet.	Mean Temp.
Ononis arvensis	Common rest harrow	100 to 1000	46 °
Trifolium arvense	Hare's-foot trefoil	100 800	46½
Trifolium procumbens	Hop trefoil	100 900	46⅓

When soil of this nature is brought under tillage, the plants above enumerated gradually disappear; under indifferent management, however, the Polygonum amphibium and Ononis arvensis are not readily extirpated. The plants found amongst the corns are, or ought to be, chiefly annuals, of which the following are the most characteristic.

ANNUAL WEEDS.		ELEVATION.	CLIMATE.
Linnean Names.	*English Names.*	Feet.	Mean Temp.
Anagallis arvensis	Scarlet pimpernel	100 to 500	47 °
Veronica hederifolia	Ivy-leaved speedwell	40 800	46½
Scandix Pecten veneris	Needle chervil	40 600	47
Sinapis nigra	Black mustard	0 500	47
Ervum hirsutum	Hairy tar or fetter	100 800	46½

The soils enumerated under the four above divisions, if they are met with within the 56° of north latitude, and under an elevation of 400 feet above the level of the sea, are capable of carrying wheat in perfection. The clays, if under an elevation of 300 feet, will produce excellent crops of beans with good management. Oats and barley may also form part of the rotation, but potatoes and turnips, except on the first and fourth division, are raised with difficulty. The soil composing the fourth division is seldom found at a high elevation, and is what farmers term "land that carries a clod," highly favourable for the culture of all sorts of corn and green crops.

5. *Light Black Loam, on a Clay Subsoil.*—Nearly allied to this is the next division, only it has a greater proportion of sand amongst the loam or vegetable matter, and less of clay or binding matter in its composition. The subsoil is also more various. Sometimes light black loam is found reposing on a clay or impervious "till" bottom, spongy in the winter months, and apt to throw out plants by spring frosts; many of the plants are found in soil of this nature that are to be met with on the poorer clays. The most predominant when the soil is in a natural state are,

HERBACEOUS PLANTS.		ELEVATION.		CLIMATE.
Linnean Names.	*English Names.*	Feet.		Mean Temp.
Juncus effusus	Soft or common rush	0 to	1500	45½°
Achillea Ptarmica	Sneezewort	40	1000	46
Potentilla anserina	Wild tansy or silver-weed	40	1000	46
Artemesia vulgaris	Mugwort	100	800	46½

The last continues some time after the ground is cultivated. The annual plants, indicative of this soil and subsoil, are,

ANNUAL WEEDS.		ELEVATION.	CLIMATE.
Linnean Names.	*English Names.*	Feet.	Mean Temp.
Raphanus Raphanistrum	Charlock	200 to 700	46½°
Rumex acetosella	Sheep's sorrel	100 900	46½
Chrysanthemum segetum	Corn marygold	300 800	45½

In wet sandy furrows, and at the ends of ridges, Juncus bufonius (Toad rush,) elevation 100 to 900 feet 46½°.

None of the above plants indicate great richness in the soil. Oats, barley, pease, potatoes, and turnips, succeed well on such soils, under favourable cultivation; and when there is a quantity of small stones on the surface, flax will be raised with advantage.

6. *Light Black Loam on an open Subsoil.*—When light black loam is found on an open or gravelly subsoil, the plants most conspicuous are

SHRUBS AND HERBACEOUS PLANTS.		ELEVATION.	CLIMATE.
Linnean Names.	*English Names.*	Feet.	Mean Temp.
Spartium, now Genista Scoparia	Common broom	0 to 900	46¾°
Ulex Europæus†	Common furze	40 740	47
Centaurea nigra	Black knap-weed	40 990	46½
Galium verum‡	Yellow bed-straw	40 1000	46
Senecio jacobea	Common ragwort	0 900	46

The last plant indicates a favourable soil and subsoil. When, by cultivation, these plants are displaced, they are followed by

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* This plant indicates a pernicious subsoil.

† This plant indicates a more favourable subsoil.

‡ On very dry soils.

ANNUAL WEEDS.		ELEVATION.	CLIMATE.
Linnean Names.	*English Names.*	Feet.	Mean Temp.
Mentha arvensis	Common corn mint	40 to 900	46½°
Centaurea Cyanus	Blue bottle	40 800	46¾
Sherardia arvensis	Corn madder	100 600	47
Lithospermum arvense	Corn gromwell	100 600	47
Alchemilla arvensis *	Parsley pest	200 900	46¾
Avena elatior of English botany	Tall knot-grass	40 900	46¾

which last is a troublesome perennial plant in light lands.

The common corn thistle will also be found a troublesome intruder where the furze was formerly established. Where the above plants are found to predominate, corn crops, of every description, will succeed, if the climate is favourable. The soil may be found rather light for beans, and too open for wheat; but eating off turnips with sheep, and allowing the grass division to be two years under pasture, will improve the texture of such soil.

7. *Sandy Soils.*—On sandy and gravelly soils the broom, as a shrub, is found to predominate, particularly above freestone rock. Where the sand or gravel is of a calcareous nature, the whin acquires an establishment. The herbaceous plants peculiar to such soil are

HERBACEOUS PLANTS.		ELEVATION.	CLIMATE.
Linnean Names.	*English Names*	Feet.	Mean Temp.
Lotus corniculatus	Bird's-foot trefoil	100 to 1200	45°
Campanula rotundifolia	Blue bell flower	100 1000	46
Euphrasia officinalis	Eye bright, an annual	300 1200	45
Anthoxanthum odoratum	Sweet-scented spring grass	0 1200	46
Arenaria Peploides †	Sea side sandwort	0 0	48

When sandy soils in tillage receive too much of the harrow, the common spurry often destroys the growing crop. The Triticum repens, (common couch-grass), is a troublesome plant, and requires close attention to the cleaning of drill crops to keep it under.

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* This plant indicates the absence of manure in the soil.

† Near the sea shores.

The annual plants found amongst the corn, under proper cultivation, are

ANNUAL WEEDS.		ELEVATION.	CLIMATE.
Linnean Names.	*English Names.*	Feet.	Mean Temp.
Spergula arvensis	Common spurry	0 to 600	48 °
Lamium purpureum	Purple dead nettle	200 000	46
Fumaria officinalis	Common fumitory	100 1000	46½
Thlaspi Bursa pastoris	Shepherd's purse	40 1000	46½
Scleranthus annuus	Common knawel	0 1000	46⅓
Arenaria Serpyllifolia	Thyme-leaved sandwort	0 1000	46⅓
Gnaphalium germanicum	Common cud-weed	0 900	46½

Soil of this description is improved by lying long in pasture, and by eating turnips off it with sheep.

8. *Moor.*—The eighth division is moor. Under this division may be included heath pastures in general, containing a considerable proportion of peat in the soil, with the subsoil exceedingly various, as indicated by the plants found. Many of the plants formerly mentioned are to be met with in low moors; and when those which have been pointed out as indicating favourable soils or subsoils occur, the soil where they are found to prosper will contain similarly favourable qualities; for instance, where the whin, the ragwort, the Lotus corniculatus, the Orobus tuberosus, and the Viola montana, are found to predominate in moor-grounds, though these plants are mixed with heath, the ground, if stones or steepness prevent not, may be improved by cultivation; but where the heath is found mixed with a moss, the same as here attached *, and the plants above specified absent, the soil and subsoil is sterile, and will not pay

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* The specimen attached, is the Cenomyce rangiferinus or rein-deer moss, of which the beautiful description by Linnæus will be found in the Miscellaneous Notices of this Number.—(Edit.)

the expence of culture, and might be planted with the larch and Scots fir to afford shelter and materials for fences to the neighbouring grounds.

The following plants in moors indicate a wet retentive subsoil:

HERBACEOUS PLANTS.		ELEVATION.	CLIMATE.
Linnean Names.	*English Names.*	Feet.	Mean Temp.
Salix repens	Dwarf Silky Willow	20 to 850	46½°
Pinguicula vulgaris	Butterwort	100 1200	45
Carex pilulifera	Round-fruited Carex	100 1200	45
Juncus squarrosus	Moss Bush	100 2000	43
Scirpus cæspitosus	Scaly Stalked Club Rush	400 2000	43
Narthecium ossifragum,	Lancashire Narthecium	400 1200	44
Parnassia palustris	Grass of Parnassus	200 1200	44½

On dry moors, containing a considerable proportion of peat earth:

HERBACEOUS PLANTS.		ELEVATION.	CLIMATE.
Linnean Names.	*English Names.*	Feet.	Meam Temp.
Genista anglica	Needle or petty whin	300 to 1200	44⅓°
Nardus stricta	Mat grass	40 1200	45
Viola lutea	Yellow mountain violet	300 1000	45¾
Tormentilla officinalis	Common tormentil	400 1200	44
Gnaphalium dioicum	Mountain cud weed	400 1400	44

9. *Marsh.*—Marshy soils are found in their natural state to produce the

HERBACEOUS PLANTS.		ELEVATION.	CLIMATE.
Linnean Names.	*English Names.*	Feet.	Mean Temp.
Lychnis Flos-cuculi	Ragged robin	0 to 900	46¾°
Menyanthes trifoliata	Fringed buck bean	0 900	46¾
Caltha palustris	Marsh marygold	0 900	46¾
Veronica Beccabunga	Brook-lime	0 1200	46
Comarum palustre	Marsh cinquefoil	200 1200	45
Galium uliginosum	Marsh bed-straw	0 1000	46
And near the sea the			
Triglochin maritimum	Sea arrow-grass	0 0	48
Poa procumbens	Sea-marsh grass	0 0	48
Carex pallescens	Pale carex	0 500	47
Carex riparia,	Great common carex	40 800	47⅓

When such marshes are dried, as they frequently contain a large proportion of decayed aquatic plants, they prove highly fertile, and few weeds appear after they are broken up. The most troublesome to farmers, are such as are introduced amongst seed grain, as

Galium aparine (goosegrass), elevation 0 to 800 feet 47⅕°.

When the marsh is incumbent on marl, the Tussilago Farfara, (common colt's foot), and the Tussilago Petasites, (common butter bur), are not easily rooted out. It may be remarked, that these plants are so partial to calcareous soils, as to form a signal to the natives of the lower valleys of Switzerland where to sink for marl *.

10. *Peat.*—Peat, or what is provincially termed moss, is often found without many plants covering the surface. Where the surface is dry, the Erica tetralix, (cross leaved heath), and the Agrostis canina acquire an establishment. In the hollows, are found

HERBACEOUS PLANTS.		ELEVATION.	CLIMATE.
Linnean Names.	*English Names.*	Feet.	Mean Temp.
Eriophorum polystachion	Cotton grass -	40 to 1000	46°
Vaccinium oxycoccus	Orange berry -	40 500	47
When moss is reduced to a state of cultivation, by draining, the annual plants appearing are			
ANNUAL WEEDS.			
Bromus mollis -	Soft brome grass	100 600	
Myosotis arvensis -	Field scorpion grass	0 800	
Avena fatua - -	Wild oats -	0 800	

And the Galium aparine, when its seeds are introduced amongst oats or barley seeds.

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* This was communicated to the writer of this essay by Monsieur Foucas, a native of Switzerland, when he was on an agricultural tour through Scotland last summer (1825.)

The higher mountains of Scotland abound with rare plants; but these are more interesting to the botanist than to the practical farmer.

11. *Mountain Pastures.*—The Calluna vulgaris, (common ling or heather), is by far the most common plant on the lofty mountains,—it is also found in low moors, within a few feet of the level of the sea, and always indicates a considerable proportion of peat in the soil. The Astragalus uralensis is found near the Frith of Forth, and on some of the Highland mountains, along with the Dryas octopetala, (mountain avens), about 1500 feet above the sea, on light sandy soil, incumbent on limestone rock. The Salix reticulata, (reticulated willow), is found in great abundance on micaceous soils on the hills of Benmore and Schehallion,—the Gnaphalium alpinum is found in plenty on the summit of Ben Lawers,—the Narthecicum calyculatum of English Botany, is found on the sides of that hill,—the Rubus chamæmorus, (cloud-berry), is found in deep moorish soils, on retentive subsoils, on the north side, and near the summit, of many of the Highland mountains,—the Arbutus Uva Ursi, (common bear-berries,) and the Habenaria albida distinguish the rocky pastures on lower part of slate hills.

12. *Woods.*—In the dens wholly inaccessible to the plough, and which are intended for plantations, the following plants, the natural productions of such dens, may assist in selecting suitable trees to the soil.

Where the Pteris aquilina, (the great brake or fern), is found in abundance, the oak will be found to succeed;—the Luzula maxima, (great wood rush), and the Paris quadrifolia, (herb Paris), delight in tenacious soils, suitable to the hazel, and the elm,—the Lychnis dioica, (red campion); the Ranunculus Ficaria, (pilewort); the Mercurialis perennis, (dog's mercury), indicate a good soil for the maple and the ash,—the

Anemone nemorum, (wood Anemone), grows on a soil suitable to the birch,—the Geum rivale, (water avens), and the Geranium pratense, are found by the sides of rills, where the alder and Huntingdon willow will acquire a rapid growth.

Before concluding an essay on a subject of so much importance in rural economy, it may not be altogether out of place to point out the kinds of trees most likely to arrive at maturity in hedge rows, or in masses of plantations in each of the divisions we have made, of the soil and subsoil above treated of. It is too evident to every traveller that hedgerow trees are neither planted nor reared with the skill and attention requisite to produce lofty timber in this country.

The following remarks are submitted, under the expectation that they may excite attention to a topic so nearly connected with the interest of the landed proprietor, and the beauty of the country.

In the First and Second Division 'Alluvial Soil,' Huntingdon willow, poplar, and alder, will succeed either in single rows, or in larger plantations.

In the Third Division, the Scots fir will grow in large masses, and form fine timber, not so liable to decay as when planted on drier and more open soils.

In the Fourth Division, the oak and ash will form elegant hedge-row timber, if the pruning and protection of the young plants are attended to. The elm is likely to reach maturity in the soil treated of under the Fifth Division; and the beech on those soils treated of under the Sixth and Seventh Divisions. The larch and Scotch fir are fittest for moors and higher grounds, and where, in any case, the soil or subsoil approximates to any of the fore-mentioned description of soils, the plants should be selected accordingly; the birch, it may be added, will form an excellent variety, well adapted to sub-humid soils in high situations.

ESSAYS ON CONVERTING TO ECONOMICAL USES TREES USUALLY TREATED AS BRUSHWOOD.

ESSAY I.—*By the* Rev. Dr SINGERS, *Minister of Kirkpatrick-Juxta, Dumfriesshire.*

THE lime-tree, the poplar, the alder, the birch, the mountain-ash, and the hazel, are all specified in the Society's advertisement; with the addition of the various kinds of indigenous trees now treated as brushwood and neglected; but all of which may, in some way, be applied for the benefit of the proprietors and occupiers of land, and for that of the public. These are the ends in view; and they well deserve attention: For in many districts, large tracts of land are occupied with brushwood, in such a way as to be unsightly to the eye, and almost useless to the persons concerned in the soil; nor is this all, or even the worst part; for it is frequently in good lands, and sometimes in soils, that, by due attention, might become almost the best on the respective estates, that this useless brushwood appears, affording perhaps a little shelter, but, at the same time, occupying so much of the soil, as to leave it incapable of producing much grass for use to stock, and to prevent all improvement.

When the growth of such trees is kept low by cattle browzing on the shoots as they rise, and regularly consumed as part of the food, the live stock are greatly benefited by the support they find, as well as the shelter; and this essay has reference only to brushwood that has been allowed to rise, and has become almost useless for the support of live stock, as well as for any other purpose.

And in such circumstances, besides the trees mentioned above, *others* may be added with equal propriety, such as the *thorn*, and various descriptions of *willow*. Indeed almost all the irregular growing and stinted trees, naturally appearing in a state of neglect, may be considered as brushwood and treated accordingly, excepting such as are useful in respect of their bark, though still to be considered as brushwood in respect of timber.

1*st*, The *general* and easy mode of turning all sorts of brushwood to use, is to select such trees and shoots as promise to rise into useful and ornamental forest timber, and to cut down all the rest for the purpose of being converted into charcoal.

At one time it was difficult to find a way of conveyance to market for charcoal when made; but, at present, no such difficulty occurs almost in any part of Scotland. In some places it is, indeed, manufactured and used to a considerable extent where it grows, or near the place, as at Bunaw, by the Lorn Furnace Company in the smelting of ironstone. The use of charcoal, made from wood, is, at this moment, a national object in Britain, as pit-coal seldom can be found so free of sulphur as not to shorten the iron in working which it is employed; and even the mineral charcoal, which occurs rarely in this kingdom, is in no degree so trustworthy as charcoal made from trees. This, in fact, is the substance that has long given to Swedish iron the high superiority that it possesses in use, and enjoys in the markets.

It would be a national advantage to possess charcoal fitted for working iron in Britain, so as to contend in excellence with that of Sweden for malleability and tenacity. Let a market be opened for the brushwoods in general, and the charcoal, made from them, applied to this great object; and besides the advantage thus attained, others will follow. A great extent of land now almost useless, may be turned into useful meadow or pasturage, in which the choicer trees may stand, and all the bark that is of use may be applied, in order to defray expences.

The charcoal thus obtained, may also be in part applied to various other purposes. The willow and alder furnish the choicer sorts of it, for the manufacture of gunpowder: It may be used in part by the manufacturers of paint and varnish. It would be found of essential domestic use as fuel, or in order to kindle and improve other kinds of fuel: It is an excellent substance for polishing brass and copper: It is the best substance in common use for metallic fluxes; and it may be useful in removing taint from meat, and in clarifying liquors to be afterwards filtered.

This is no place for detailing the mode of manufacturing charcoal. On the great scale, this may be done on the plan which has long been practised in this kingdom, or on that which has been in use to a greater extent in France, Sweden, and other countries. For the finer purposes, and on a smaller scale, the operation is performed sometimes in iron-vessels; but in bulk, on the earth, and in the woods.

Travellers are delighted in passing through any district in which regular attention is paid to the forests, even when reared for the purpose of charcoal. No one can traverse the lands, held under long lease by the Lorn Furnace Company, from General Campbell of Lochnell, between Oban and Inverary, without a feeling of this kind; when the former waste state of that large tract of country is also contemplated, and contrasted with the marks of industry which appear, and the beautiful appearance of the regularly preserved and rising trees.

2d, Another general purpose to which brushwood may be largely applied, is in constructing the roofs of cottages where it is difficult to find regular timber; and, for this end, the smallest parts are useful, as well as the largest, with a view to bring into proper shape, as well as to give strength.

3d, It is not uncommon to see brushwood employed as common fuel; and, if cut and dried, and properly put up with this view, it answers well. The brush of oak and ash burn admirably indeed in the sap, which is inflammable.

4th, And various other purposes might be mentioned, to which brushwood is, or may be, applied. It answers the purpose of a fence, when put up into what are called stake and rice fences,—often useful to give temporary protection to plantations; and which may be removed and converted into fuel when that purpose is accomplished. It may be of great use on the top of an earthen wall (otherwise insufficient) by a single row of plaiting on the top of short stakes. It may be applied for the purpose of wattles or hurdles in out-buildings requiring free ventilation, and in temporary wears, for the use of sheep and cattle.

But, besides the general application of brushwood for charcoal, cottages, fuel, fences, and other purposes, there are also special economical uses to which the various kinds of it may be applied, and which are less generally and accurately known.

1*st*, The Lime-tree has been often considered merely as an elegantly formed and striking ornamental tree for avenues and lawns near gentlemen's country seats; and the timber of it has been thought of little value, so little indeed, as hardly to be marketable. But the Tilia Europæa, though not, perhaps, a native of Scotland, is indigenous in Essex, Lincolnshire, Surrey and Sussex; and the timber possessing many excellent properties for the purpose of beautiful and durable carved work, must also be valuable in many other respects. It has not been found liable to cracks, or to the worm, after standing nearly two centuries; and still preserves the original elegance of form, as carved in imitation of flowers and fruit, by Gibbons, in the Choir of St Paul's, and at Windsor Castle; so that not a doubt can exist of the value of this Linden tree for timber, as well as ornament; and, for the fragrance of its flowers, it is well known, as described by Sir James Edward Smith. On these flowers bees feed largely; and though the value of the bark is not fully known for the purpose of tanning, it has been found to afford materials for making coarse ropes. On the whole, no error can be greater than is often committed, in considering this elegant tree as of no farther use than for ornament; the red lime-tree of England, possessing many other properties, in respect of its elegantly coloured, and durable timber especially,—which ought farther to recommend it to attention, and to take it out of the class of supposed inferior timber trees.

Of the Poplar genus we have four species indigenous in Britain, the great white or Abele, the common grey, the black, and the trembling poplar. The first is considered as an ornamental tree, from the dark green colour of the leaves above, and the snowy white matting on them below; the last often grows on river banks to be a lofty tree: we do not therefore so frequently find the Populus alba or the Populus nigra, classed among brushwood. But this is oftener the fate of the grey and the trembling poplars. The roots of the former, the Populus canescens, also extend themselves widely where they grow, and interfere with those of more valuable plants; and the timber of the latter, the Populus tremula, has been considered soft, and liable to decay soon: But the bark of the poplar genus has been found to possess a great proportion of tan, so as to be of eminent value in proportion to its bulk and weight; and that of the trembling poplar or aspen has been fed on by different animals, while that of the black poplar has been used for its lightness, in place of cork, by fishermen for their nets. All these trees grow easily and rapidly in their proper soils; and such of them as may happen to be dwarfish, may be of use in various ways, if the bark be separated, and for various purposes, if the timber be applied, for charcoal, or fences, or cottages. When poplars rise into trees capable of being sawn into deals, these are useful for many purposes, especially those of the black poplar, not being so liable to split as fir deals, nor to warp in the sun as deals of larch.

The alder, the white and the dwarf birch, are all indigenous, and all belong to the genus Betula, being also very often classed with the brushwood of the country, and their proper uses being little known, and less attended to.

With respect to the alder, it is often seen beautifully and regularly fringing the banks of the translucent rivers in the remote vales of Scotland, which the roots are not only fed by, but whose banks they defend materially against the force of inundations. The bark of this tree is used for the purpose of dyeing black, and the wood of it is particularly adapted for pump-trees, and for any purpose in or under water. For these reasons, and also for its particular quality for making gunpowder when burnt into charcoal, the Betula alnus is cultivated in the low countries of Holland, though in Scotland it is far too generally neglected, as of little or no value.

The dwarf birch (Betula nana), though found occasionally, as quoted by Sir James Naismyth, to the illustrious author of the Flora Britannica, growing on the spongy heaths of the Scottish mountains, is a plant so seldom found in quantities, and of so diminutive a size when it appears, that it is hardly of much importance to dwell upon its uses, especially when it occupies the most barren spots on elevated mountains, where even this plant may be of some use to the live stocks furnishing in a small degree both food and shelter. To render it more useful as an edible plant, it may be easily cut at proper times, when the sap has not risen, and then it will put forth new and more tender shoots, while the brush may be used for brooms, fences, or other purposes.

But the white birch, the Betula alba, (one variety of which is called weeping birch, from its pendulous branches) deserves far more attention than is now commonly paid to it. This tree has a snow-white bark, and under it the epidermis is of the consistence of paper, having been formerly used for the purpose of writing on. The bark of this tree is applied to many purposes,—among others, for tanning leather, covering roofs, and constructing light canoes; and also, as is believed, for yielding that essential oil which is used in tanning Russian leather, and to which it owes its peculiar and highly valued odour.

The timber of the Birch was more used and more valued in former times. It was not so strong as the ash for harrows and other farming implements, but it was not so ready to split; and for roofing cottages it is still in estimation; being also the wood very generally preferred for making clog-soles, to be worn in place of shoes. The branches being cut off, and the twigs separated, these are made into brooms. The whole tree is adapted for burning into charcoal of the best quality, and even the sap has been drawn out in spring and made into wine.

A great extent of land being occupied by this tree in various parts of Britain, and the plants being easily disseminated naturally, and growing with more than ordinary hardiness, where other forest trees would not always prosper, it seems of importance to turn the trees, and even the brush underwood of the birch, to more extensive and valuable uses.

Mountain Ash is hardly considered as a tree of any value, except merely for ornament, and the food it supplies to birds; but its timber possesses a great degree of tenacity, fitting it for various useful purposes; and the peculiar flavour of the bark and the fruit has induced some to think it probable, that the Sorbus aucuparia may be found useful in other respects.

Every one is acquainted with the Corylus avellana, or common hazel tree. It is, however, commonly quite neglected, and only sought after when the nuts are ripe, or when the shoots are wanted for hoops to casks or dishes. But if due care were taken of the hazel, much better fruit might be obtained from it; and also more and better shoots for the cooper and the staff-maker. As it is, the sprouts are much browsed on by cattle; and when they rise too high for this purpose, no brushwood answers better for fences, and for the ribs of creels and baskets, as well as other useful purposes.

The timber of this tree is tough and light, and may always be applied to some use, when the land is cleared of it.

The White Thorn, Mespilus or Cratægus Oxycantha, which is propagated over the mountains and forests, by means of birds carrying the fruit thither, (besides the use to which the branches may be applied in making up fences, or for the purpose of wears against cattle, when hung over trees across fenced rivulets), contains in the stem very hard and very heavy timber, which the carpenters apply to various useful purposes, in preference to any other wood.

Of the forty or fifty species of Salix or willow found indigenous in this country, many are undoubtedly to be considered as mere brushwood, in the neglected state wherein they grow; and yet most of these may be applied to such uses, for bark and timber, as fully to repay the trouble of clearing them out. The red wood of the willow is one of the best known for the teeth of hay rakes; and when the timber is large, and fit for being sawn into deals, they are tough and durable, especially in the Huntingdon willow, which is far too little cultivated, and yields more tan from the bark than most other trees. The value of the long leaved willow, Salix triandra, and of the basket osier, Salix Forbyana, for making baskets, is generally known. But it is not so with respect to other species of willow, which appear among other brushwood quite neglected and unknown. The highly superior quality of the Bedford willow, Salix Russeliana, for the purposes of the tanner, has been only of late years discovered. Few are aware of the value of the creeping dwarf willow, for binding the sandy soils where it grows by river banks; or of the velvet osier, Salix mollissima, which furnishes the best and largest supplies of osiers for basket-making. No tree, in general, answers more useful purposes than the varieties of the willow; and if not wanted for other uses, it is commonly among the best of trees for the tanner and the charcoal maker.

In clearing out brushwood, nothing is of more consequence, wherever sheep are allowed to pasture, than to destroy or keep down sloe trees and brambles. The former are easily hoed out and burned; but the bramble requires more pains; and yet if the long trailing shoots are taken out in proper season, they are just the best substance to be used, when split down, for making bee hives. Even the austere fruit of the Prunus spinosa, or sloe, is not without its use, nor the dark berry of the common bramble, the Rubus fruticosus, gathered by the woodman's hand.

The circular saw, driven by a water-wheel, is now found to be of eminent use for shaping into many useful purposes, and among others for staves of herring and other barrels, a variety of trees considered as brushwood; and, among others, ash and other stunted trees, and for which there is always a demand. The same instrument is useful for making lesser pieces of timber into staves for butter firkins, clog soles, and the like. The manual labour of clearing out brushwood, and applying it to useful ends, may be thus considerably abridged, when there is a mill at a moderate distance, admitting of such an addition to its machinery. The smaller and tougher sorts, made up into faggots, may be sold for the coal and other public works, where strong creels and baskets are wanted. The rest may often be made use of to accommodate the surrounding population, after the more saleable parts have been disposed of.

Akin to the work of clearing out brushwood, is that of turning to some useful purposes the *strong heath*, *ferns* and *rushes*, that are frequently found growing among them; and for the strong *heath*, a short stiff scythe is used, which cuts it of the full length, in which state it makes the *most durable thatch for cottages ever known*, and lasting, in some cases, according to good information, forty years. The *fern* is often pulled by hand; but this process being rather tedious, it may be cut by scythes, if thick—and by strong sickles, if growing thin; in all cases, as low as possible. It is then just the next best substance *for thatch*, after heath; but the fern is also most valuable for *other* purposes, especially for litter, and for covering potatoes against frost. And really one is astonished at the neglect of such valuable substances for thatching cottages, &c. in many districts where thatch is most wanted.

No good farmer is ignorant of the value of *rushes*, when cut by the scythe. If cut in this way about Lammas, the young shoots become useful to the *live-stock* in winter, when the grass is gone; and next season also, in spring. The *litter* thus obtained is well worth more than the expence; and if it be wished that the rushes should be extirpated, let them be cut twice a-year regularly.

If the clearing of brushwood be an undertaking of much labour and time, it ought to be done *by degrees*, and in lots. If there be not use for all the cuttings at one time, they will thus come to use at another time; and if the owner of the lands do not himself require them, nor his tenants and neighbours, they *may be sold* in lots, to accommodate the public, some time in every spring. In this way a great benefit may be conferred on many, while the owner of the lands is also serving his own interest, and a regular source of accommodation created.

In soft meadow-soils it may be useful *to root out* some of the *worst* plants; and by so doing, a fine productive meadow can be formed, rich in grass, and embellished with a few trees left to stand there. The writer of this has seen this operation performed to the very best advantage. It is the most expensive mode of clearing brushwood, when it is to be rooted out; but in good soils it is compensated by one or two crops. The ordinary way of *cutting over* brushwood close by the ground, and *keeping down* the stoles, by allowing cattle to browse on them, is attended with far less expence, and is, at the same time, highly beneficial. If choice trees be left to stand, they become also very ornamental, and in a short time very useful.

This paper is no way theoretical, but founded in observation and fact. One word more: let the brushwoods of Argyleshire, on the mainland, be so managed, and the soil will become far more beneficial; while the Hebrides will be grateful, and the public will gain by it.

There is little occasion to dwell on the plan which may suit various gentlemen in clearing their brushwoods,—that of immediately planting them up with useful trees. The brush may be highly useful to enclose the lands, when this is the object. As it grows again, it will shelter the young plants. The better sort of shoots may be allowed to remain; and when the others become hurtful, they can again be cleared out, and applied in the most useful way;—after which, the plantation, mixed with such choice growths as have risen from the roots, may be expected of itself to keep down this brushwood, by which in its infancy it had been sheltered.

Even the superior kinds of trees, ash, oak, and elm, should be cut down when stunted, and treated as brushwood; after which their stoles will become valuable, if duly preserved and nursed up, as in plantations. A root-grown ash possesses uncommon toughness and strength; and any traveller from Dumfries, up Nithsdale, may see what root-grown oaks may become, in the Three Brothers, growing opposite to Blackwood, the mansion of Mr Copland, where only elms and Huntingdon willows are still wanted in the numerous plantations.

October 1827.

ON THE APPLICATION OF WHALE OIL FOR CONVERTING MOSS INTO MANURE. *By* WILLIAM BELL, *Esq. Mem. High. Soc.*

ALTHOUGH this subject has not yet attracted the notice of the Highland Society, the author hopes that an account of the following experiments may not be found uninteresting.

There can be no doubt that any considerable addition to the quantity of manure upon a farm, or any material reduction in the expence of procuring it, must be a matter of importance to those who are engaged in agricultural pursuits: and it is equally apparent, that all who contemplate the improvement of land yet uncultivated, must rejoice in the discovery of a means by which such operations may be beneficially conducted, without robbing the rest of the farm of an undue share of the manure produced from itself, and necessary for the maintenance of its own fertility.

These considerations were anxiously kept in view in making the necessary arrangements, previous to undertaking the drainage of, and laying down to permanent pasture, a considerable extent of swampy land *. It was foreseen that, in these operations, a great quantity of mossy substance would be thrown out in cutting the drains, which, if not itself converted, by fermentation or otherwise, into materials for top dressing, would either permanently continue to cumber the ground, or require to be removed at great expence.

The object therefore in view, in the experiment now to be detailed, was to procure the means of converting moss, or other decayed vegetable substance, into a rich top-dressing, in a situation so far inland, that the expence of carriage from the sea coast (L. 2, 5s. per ton), precluded the use, with any expectation of profit, of blubber, bone, rape-dust, or other similar substances. Attention had been drawn to oil as a manure, by the practice of the Flemings, in forming their liquid

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* The results of these operations are detailed in a separate essay. It may be mentioned here, that a large extent of this land has been laid down to permanent pasture without cropping, and without the use of the plough, by paring, and burning, and sowing grass-seeds with the ashes; that the meadows have, for four years, been pastured, with a full bite, from the middle of March to the 23d of May; that 348 stones of 22 lb. of hay per Scotch acre have, each year, been reaped in forty-three days, and the meadows thereafter pastured till the end of November, thus giving twenty-six weeks pasture.

dung pits; and by the fact, that, in the use of blubber and rape-cake for this purpose, the benefits following their application are in the precise proportion of the inefficacy of the means employed for expressing the oil from them. It was also conceived, that, to a certain extent at least, the nutritious matter contained in bone-dust may be traced to the oleaginous particles of the bony substance.

It was resolved to commence with one tun of oil, and such a proportion of moss as, in all probability. that quantity of oil could easily convert by heating, into a more profitable substance.

It was further resolved, that the process of heating should be aided by a certain quantity of stable dung; and that 250 cubic yards of moss to the tun of oil should, in the first instance, be tried with 25 cubic yards of dung, though it was expected that a much greater quantity of moss might be fully converted into manure by that quantity of oil and dung.

A tun of "dreg," or coarse whale oil, therefore, costing L. 16, was purchased at Leith, and sent out at the cost of L. 2, 10s. In the beginning of June 1825, a bed was formed a foot thick of moss, which had been thrown out some time before, but which still retained all its peaty qualities, and which, though still moist, yet having lain in a heap for some months, was substantially freed of much of its superfluous moisture.

Twenty-five cubic yards of good stable dung were then laid, in a thick layer, upon this bed; above which, another layer of moss was laid, fully a foot thick. On this second layer of moss the whole quantity of oil was poured; and the residue of the moss was laid above all, and along the sides, so as completely to cover the whole well up.

In ten days the whole mass came freely into heat. It was turned, after an interval of about eight weeks, when it was found to have been greatly changed in its texture and quality. After having been so treated, it heated freely again; and, on inspection, was found to have been altogether altered. It had now all the appearance of the richest possible black garden-mould, and was quite full of large fat earth-worms. It gave out a strong oily smell, from which it was inferred that too little moss had been used; and some apprehension was entertained as to its fitness for being applied to its primary destination,—a top dressing for grass land.

The costs were as follows:

Oil and carriage, - -	L. 18	10	0
Twenty-five cubic yards stable dung at 5s., the usual price of the country, - -	6	5	0
	L. 24	15	0

No charge for casting the peat is made, both because, in this instance, it was desirable to consume the substance which had been thrown out of the ditches, and because the compound lay contiguous to the ground on which it was to be used, while the cost of casting and turning was deemed equivalent to the carriage afield of the manure that would have been required.

260 cubic yards compound, at 1s. 11¼d., about L. 25 3 9

The farm-steward was of opinion that the produce was so rich as safely to admit of its being used in equal quantities with ordinary farm dung. Two several portions of land, each of half an acre, were accordingly devoted to a trial of its powers on that principle. The one, rich old turnip soil, worth 40s. of rent per English acre; the other, new turnip land, which had never been broken up. These portions were laid off in the centre of the two several fields, and the manure was applied to the turnip crop in the usual way. The other parts of both fields were dunged with farm yard manure,—equal quantities of it and of the compound being given to the acre. The summer 1826 was not favourable to turnip crops generally, but it so happened that the crops on both these fields were very great.

On the old land the turnips grown with the oil compound sprung earlier than on the rest of the field, grew larger, and were more luxuriant, and very decidedly kept the lead, both in root and shaw, during the whole season;—but absence from the spot prevented a minute register of weight and measure being kept.

On the new land, no difference could be distinguished betwixt the crop from the two several manures; both were so good, that better could scarce have grown.

In the next crop (oats on both fields), though minutely inspected, no difference in produce could be detected; but the same causes prevented the circumstances of the case being duly attended to.

This year both fields are in grass, and both will be hayed. At present (30th June) no difference can be detected.

No inconvenience from the oily smell was felt when the residue of the compost was applied to grass land. It was laid on early, and the ground was hayed. It was given to the meadows last improved, and therefore the least advanced; while rush-root compound, and other substances, were given to the older portions. The crop on each was very great; but the preference was rather given to the oil.

These results were so far encouraging, that next year, 1826, two tuns of oil were purchased at the price of L. 14 per ton, and used with rather less than 90 cubic yards of manure, and fully 900 of moss. About 550 cubic yards were used, in the first instance, in the same manner as on the former occasion, and the residue of 350 thrown in when the compound was turned. It is now believed, however, that it would have been better to have made up the whole at once, by adding to the thickness of the several layers of moss, especially the centre one.

The cost on this occasion was as follows:

Oil, two tuns, and carriage, - -	L. 33	0	0
90 cubic yards manure at 5s. per yard,	22	10	0
990 cubic yards compound at 1s. 1d., about	L. 56	13	9

The result again was very satisfactory; the moss heated fully the first time, and freely the second, notwithstanding the error committed,—the result of which was apparently to check the second fermentation a little, and to leave lumps here and there not quite decomposed. But the whole has been substantially and effectually changed, and confirms, in every respect, the result of the former experiment.

On both occasions moss thrown out at the same time remained altogether unchanged; while the one was luxuriantly covered with vegetable growth, the other continued a sterile heap.

This year 5 tuns of oil have been bought at L.9 per tun, and carriage 40s. - -	L. 55	0	0
On the same principle as before, the dung will cost, for 225 cubic yards, at 5s. -	56	5	0
To be used with 2250 cubic yards of moss,	L. 111	5	0
2475 cubic yards, produce at 10¾d. about	L. 110	17	2¼

The effect of these operations is probably twofold. In the *first* place, the oil, thus divided, may be rendered a fit element for the nutrition of plants; and, in the *second* place, unquestionably much benefit is secured by the change effected on the substance of the peaty matter. Fully the larger share of benefit is ascribed to this circumstance; but, at the same time, it is very probable that it may be found by experiment that oil may, with great advantage, be used with every other species of manure, or even with compounds of purely earthy ingredients *.

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* At the late Mr Henderson's of Press, in consequence of the first of these experiments, linseed-cake was mixed in the proportion of ten cart load of earth to one ton. It could not be used for some days, and was put into bags. When these were opened, the heat was so great that the mixture could not be handled. It was used for land on which turnips for seed were raised; and the crop was fully equal to another portion where bone dust was used. The pure oil would probably be cheaper than the cake, as containing, in less space, more of the material, which alone can be of any value.

It is intended this year to mix a considerable portion of rich earthy deposit, with some of the compounds which are to be formed, and to cast and incorporate them carefully with the peat. It is also intended to use peat and oil compound as manure, to lay down a field after fallow.

It is farther proposed, in taking out an old grass field, for the purpose of being again laid down in grass, to avoid the usual practice of rotting the turf on the surface, by which it is apprehended much time and much vegetable substance (valuable if properly rotted) is lost; and, instead of this, to pare the surface thin with the paring plough, and to lay up the turf in heaps; by which process it is expected that the whole will be heated and rotted *. Oil will be used on this occasion with the greater part, but some turf will be tried by itself alone; some will also be tried with oil and a little manure. If these operations succeed, it is expected that a great addition may thus be made to the quantity of manure which, at a moderate expence, may be made upon and for each field. The idea is mentioned before the experiment is completed, because the operation is so simple that it may be tried by any one, and all analogy is in favour of its success. Some attention shall on these occasions be paid to the process, carried on in different ways, and if the results shall prove to be interesting, they shall hereafter be stated.

ON THE COMPARATIVE VALUE OF POTATO AND GEORGIAN OATS.

By Mr Wilson *of Preston. In a Letter to Charles Gordon, Esq.*

SIR,

I BEG leave to hand you a statement of an experiment made by me last year, of the difference in value between the Georgian and Potato Oats, upon two English acres of equal land. The seed of the Georgian oats I got from Captain Barclay. The quantity sown upon an acre was six bushels, and of the potato four bushels. The Georgian were reaped ten days earlier than the potato, but they might have been fourteen days. The appearance of the Georgian was by far the most luxuriant during the summer, till the end of July, when the potato shot out considerably longer in the straw. They were carefully cut down and stacked till the month of March 1826, when they were thrashed, and the result proved as follows :

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* The gathering of the turf of two ridges into one long heap, from end to end of the field, in the form of a potato pit, is found to cost 20s. per acre. Thus no carting, which would add greatly to the cost, is necessary, either in gathering, or in spreading.

	Stones.	Pounds.
Weight of straw of the potato oats per acre	317	6
Do. do. Georgian do.	238	12
	78	8

The quantity of potato oats per acre was 69 Winchester bushels, and the Georgian 68.

	Stones.	Pounds.
Weight of Meal from six bushels of the potato oats	11	5
Do. do. do. Georgian do.	10	6
	0	13

Superiority in value of the Potato Oats.

Saving of seed 2 bushels per acre at 3s. 4d.	L. 0	6	8
Additional quantity of straw 78½ stones, at 2d.	0	13	1
Additional quantity of meal, 12 stones 6 lb. per acre, at 2s. per stone,	1	4	10
	L. 2	4	7

The measure is the Winchester bushel, and the weight Avoirdupois.

It will be seen from the above statement that the potato oats have produced a considerable quantity, both of straw and meal, more than the Georgian, at least equal to L. 2 Sterling per acre; and the only advantage the Georgian appear to possess is their early ripening. The bulk of straw of both was uncommonly great, but the inferiority of the Georgian in this respect has determined me to discontinue the cultivation of them to any extent.

PRESTON,
28th November 1826.

RECEIPT FOR MAKING CHEESE, IN IMITATION OF DOUBLE GLOUCESTER. *By* JAMES BELL, *Esq. of Woodhouselees, Mem. High. Soc.*

IT is material to have good rennet made from calves' stomachs, properly cured, for curdling the milk, the method of doing which is known to every good housewife.

The milk immediately from the cows must be put through a strainer into a tub sufficiently large to hold the quantity of milk required for the cheese intended to be made.

Put first into the milk a quantity of the finest cake-arnotto, which is manufactured in London for the purpose of colouring cheese. This is done by tying it in a piece of thin muslin, and immersing it in the milk, and shaking it till the milk is tinged to the colour you wish your cheese to be. The quantity used in the specimen produced is noted below.

Pour into the milk a sufficient quantity of the rennet, to coagulate or curdle it, but not more; and allow it to stand till the curd is quite formed, when it may be cut or broke with a knife, and the whey taken out with a skimming dish. The curd must be made firmer by degrees, taking out the whey by pressing it with the hands into one side of the tub. This operation is pretty severe exercise for two stout dairymaids.

After this operation the curd is cut in pieces of about an inch square, and put into a cloth, then put into a large wooden drainer, which has a cover of a size to go within the drainer. A weight of about half a hundred weight must then be laid on the top of the cover, which presses the curd moderately.

After remaining fifteen to twenty minutes, take the curd out, and cut it again into similar pieces, or rather smaller, putting it again into the drainer, and press it as before. Take it out again in about twenty minutes, repeating the same process as before. Take it then out of the drainer, and put it into a tub or vessel, and cut it as small as birds' meat, with a knife made for the purpose, having three blades, which facilitates the operation.

The curd is then salted with the best salt, and well mixed, as much as is considered necessary. It is then put into a cloth of thin gauze made for the purpose, and put into chessel or chess, and that into the press, taking it out from time to time, and giving dry cloths, till, by the pressing, the cloths come off quite dry, which is the rule for knowing when it is enough pressed; but it is perhaps an advantage to have so many presses as to allow the cheese to remain two days or upwards. If the last cloth is of a finer texture, and dipped in warm water, wringing it before putting it on the cheese, it will give it a finer skin.

It has been omitted to state, that, while the curd is pressing in the drainer, it ought to be set before a good fire; and also, after putting it into the chesset, it ought to be placed there for twelve or fifteen hours, with about half a hundred-weight on it, previous to putting it into the cheese-press.

The cheese, after taken out of the press, should be laid on a tolerably dry floor, or shelves, the former perhaps preferable, so as not to dry them hastily. They ought, in the first instance, to be turned daily, and rubbed with a dry cloth. After becoming firm, their being turned and wiped twice a-week will be sufficient. It is of great use, to keep flies from coming near the cheese and breeding maggots, to rub the floors or shelves with elder or bour-tree leaves.

The quantity of arnotto used in the specimen produced *, was one cake of about one quarter of a pound weight to ten cheeses, of 20 to 22 pounds each; and the quantity of salt about 8 or 9 ounces.

100 quarts of milk are found to make a cheese of 30 pounds, or about 3 quarts to 1 pound of cheese.

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* The cheeses of this variety were found entitled to the first premium given by the Society.—Edit.

DESCRIPTION OF A PORTABLE WEIGHING-MACHINE FOR GOODS IN SACKS, &c. *Invented by* MR JOHN SMITH, *King's Stables, Edinburgh.*

THIS machine, which is upon the principle of the Roman balance or steel-yard, may be used for a variety of purposes, but it is principally intended for weighing grain, flour, or any other commodity usually put in a bag for carriage or keep. A is the fulcrum of the lever B, and C is a platform on which a bag, containing corn or other goods, may be placed, and its weight immediately ascertained, by placing one or more small weights on the platform D. This platform is supported, from the long end of the lever-beam, by a slight strut of wood *a* ; and that it shall maintain an upright position, there are two slight iron stays *b* attached to the side of this support: these move on pivots at their points of connection with the support, and also at the opposite side of the box in which they are placed. Thus, then, these stays move in arcs, when the platform D is depressed or elevated. Also, on one of these stays, there is placed a small weight *c*, which can be shifted nearer to, or farther from, the support *a*, the effect of which is, that, under all circumstances, the platform C, together with its appurtenances, can be adjusted to the balancing power of the platform D. Similar to the stays just mentioned, there is another one *d* attached to the support *a*, to prevent its lateral inclination; and, that the support may be drawn aside by the stay as little as possible, it is made double, having a pivot at *d*, and another where it is fixed to the inside of the box; by these means, collectively, the platform D moves up or down nearly in a straight line. F is a small lever connected with a crank, by which the platform D can be brought up from within the box, when it is wanted to adjust the balance upon it. This piece of mechanism will be readily understood by inspecting Fig. 3., in which the crank, its centre of motion, and the catch connected with it, that lifts up the strut, are seen.

The platform C, and G, Fig. 2., together with the upright framing H, are supported by the short arm of the steel-yard; and to prevent them from swinging forward, there are attached two stays or sticks, k, which are, in all respects, similar to those already described; and a third one *f*, prevents the framing or uprights H from inclining to either side.

In order to use the machine, if the bag happen to be standing full on the floor, let it be placed on the platform C, by means of a sack barrow, and its weight can instantly be seen by the known weight on the platform D. Should the bag be empty, while it is wanted to put an assigned weight into it, then tuck its mouth on each of the jointed rods *m n*, next, find the weight of the empty sack, by placing the proper weight at D, then add the weight bearing the number of pounds required. Should the bag be on a person's back, let the platform G be folded down, as in fig. 2, on which the sack can be rested, and its weight, at same time, ascertained. The use of this second platform will be found convenient, as the bearer of the bag can, after its being weighed, again take it on his back without assistance.

When at work, the under framing of the box, containing the apparatus, rests upon the floor; but for its easy removal to any particular place, the two wheels behind are brought into action, which can be [illegible] pulling up the lever L, while another person holds up [illegible] front of the machine, and pushes it before him like a [illegible] barrow.

The balancing weights are only [illegible] to the machine itself; but the balancing powers, [illegible], are all adjusted by the imperial standard [illegible] the county of Edinburgh, and verified by the keeper [illegible].

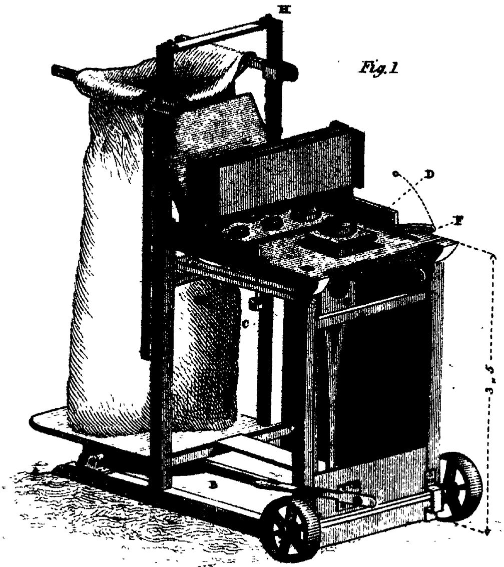

Fig. 1

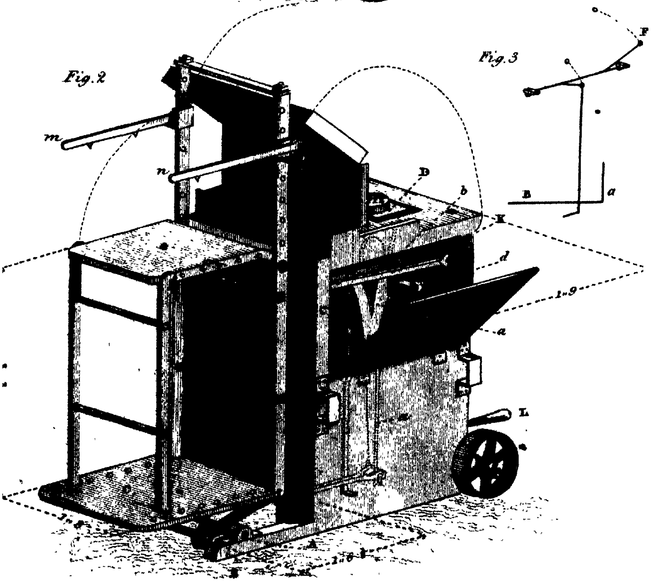

Fig. 2

Fig. 3

ESSAYS ON THE IMPROVEMENT OF PASTURE AND GRASS LANDS BY TOP-DRESSING, AND OTHERWISE.

ESSAY I.—*By* JAMES BLAIKIE, *Esq. Advocate in Aberdeen.*

"Fronde super viridi."

THE policy of laying arable lands to permanent pasture has been frequently questioned, as well as keenly discussed, and many able and ingenious arguments have been advanced, both in support of and against the practice; but it has never been disputed, that land which has been long in tillage cannot be more effectually nor more economically renovated and invigorated, than by throwing it into pasture for a few years.

It sometimes happens, too, from the peculiar circumstances of the property, or the views of the proprietor, that permanent pasture cannot be wholly dispensed with; and when the prominent station, which the artificial grasses hold in alternate husbandry, whether intended for pasture or to be cut for using in a green or dry state, is taken into consideration, it becomes an inquiry of no ordinary importance, and highly deserving the attention of the national institutions, to inquire by what mode of treatment grass-lands of every description may be brought to, and continued in the most productive state.

In endeavouring to throw some light upon this inquiry, which is all that will be attempted in the following remarks, the most simple arrangement will probably be, to consider each description of grass-land separately, and the subdivision of such lands into

1. Water Meadows;
2. Natural Pastures; and
3. Tillage Lands;

of which the last is by far the most important, appears sufficiently minute for the purpose in view. As it is, however, of the utmost consequence, as well for producing good grass as for insuring its continuance in a thriving and productive state, that both meadows and arable lands should be carefully prepared and properly laid down, it is hoped that a few practical observations and hints on these points, in treating of the improvement of such descriptions of grass-lands, will not be found altogether useless or misplaced.

1. *Water-Meadows.*

It will, no doubt, be readily conceded, that, whatever may be the views or ultimate objects of the agriculturist, whether to raise corn or to rear stock, the possession of a productive meadow affords him many advantages. With little other aid than what the water which flows over it affords, a large and valuable produce is furnished in spring, in summer and in autumn, while the manure made from this produce goes to enrich the rest of the farm. If he has a sheep stock, he may relieve his other pastures by bringing part of his flock into the meadow in spring, at which season, both breeders and flooders agree that sheep may feed there in perfect safety.

As the grass, too, rises earlier than in hill pastures, the meadow forms a comfortable provision for the support of early lambs in a backward spring; or, if hay is preferred, a very considerable weight may be almost always depended on. In most situations, therefore, where there are low grounds, either liable to be overflowed, or where a command of water sufficient for the purposes of irrigation can be obtained, the most eligible mode of occupying them seems to be by the formation of water-meadows; all soils, even the richest, will be benefited by water, and, by means of it, the very worst land may be rendered infinitely more valuable than before. At the same time, however, the greatest admirers of water-meadows must admit, that, most useful and advantageous as they unquestionably are, the system may be carried to excess, at the expence of both utility and profit; and it ought ever to be the subject of attentive consideration, whether, in situations capable of thorough drainage and protection from overflowing, the use of the plough may not prove the most beneficial mode of management.

It would be foreign to the intention of these remarks to enter on a minute description of the various kinds of water meadows, and the most approved modes of constructing them, under the various circumstances which occur in practice; but it may be noticed, in general, that, when the situation for a water-meadow of any sort is decided on, whether it be intended for the improvement of the natural herbage, or for the production of artificial grasses, the first operation is to effect the complete drainage of the ground, for, until that is performed in a sufficient manner, the land will continue wet and spongy, the grass will be thrown out in winter, and little advantage can be expected from the undertaking. In conducting this operation, the flooder's attention should be directed to the nature of the drainage and the direction of the drains, because, in some situations, those necessary for irrigation may be so laid off as to serve for the drainage of the land, and, in others, the master feeder, with the additional expence of the thorns, and the trouble of planting them, may be rendered a neat and a sufficient fence. When the drainage is completed, the ridges formed, the conductors finished, and any blanks or bare places on the surface filled up with clean turf, the meadow, if the natural herbage is meant to be continued, will be ready at the proper season for the admission of water; but if artificial grasses are preferred, a great deal more remains to be performed, especially in preparing the ground for receiving the grass-seeds, which is of very material moment.

If the sward is so coarse and tough as to render the breaking up by the plough very difficult, or if it be wished to have coarse grounds speedily prepared for growing clover and other grasses, especially if the subsoil be of a wet, cold, adhesive nature, then paring and burning the surface, and liming, should undoubtedly be resorted to; but the production of grasses will be better promoted, in most cases, by repeated applications of the plough before winter, and thereby reducing the surface to as fine a mould as possible, in the course of carefully cleaning the ground by a complete fallow during the ensuing summer.

After this treatment, and slightly manuring with such compost, as can be most easily procured (to save the farm-yard dung) the meadow ought to be moderately limed, and sown towards the middle of August with a mixture of such grass-seeds as may be judged most suitable for the soil and the situation, then harrowed and rolled, which will complete the operation for that season.

With respect to the varieties, the proportions, and the quantities of grass-seeds which ought to be sown in meadows, there ever will be differences of opinion; and so much depends on soil, on climate, the nature of the water, and the ideas, perhaps prejudices, of different operators, that no general rule can be laid down, but no pains should be spared to procure perennial seeds, and of such kinds as are known by experience to agree with soils and water of similar descriptions. In peat and wet marshy soils, however, Fiorin *(Agrostis stolonifera)*, Common Meadow Grass *(Poa trivialis)*, and Soft Creeping Grass *(Holcus lanatus)*, may be used; and in dry soils, Great Meadow Grass *(Poa pratensis)*, Vernal Grass *(Anthoxanthum odoratum)*, and Crested Dog's Tail Grass *(Cynosurus cristatus)*, in addition, have been found to answer extremely well. By diminishing the proportions of these, and adding such other seeds as seem best adapted to the particular circumstances of the meadow, a close sward of grass may soon be obtained.

It has been recommended to procure grass-seeds from natural pastures, and to follow the proportions and combinations of nature in sowing out grass-lands. But, simple and effectual as this plan seems to be, the execution and success are more difficult than they would at first appear; because plants of different sorts do not ripen at the same time; and, therefore, although a particular spot of natural grass should be saved for seed, the produce, the following year, would, in all probability, be quite different, at least in the proportions of the various grasses, as the seeds of those only which were ripe at the time of cutting could be expected to vegetate.

The object in view could perhaps be attained, in a sufficiently correct degree for practice, by gathering the seeds of the various plants in natural meadows, when perfectly ripe, and sowing a mixture of them, as nearly as possible, in the proportions in which they appear to stand on the field; or even more accurately, by cutting the grass of rich wet meadows, at different times for wet, and that of rich dry meadows also at different seasons for dry, and saving the seeds; whereby a collection of the seed, both of early and of late plants, to suit the various soils, would be obtained.

After meadow grounds have been sown out with artificial grasses, water should not be admitted for a considerable time, because it invariably causes the land to throw out the plants, unless they have become sufficiently rooted; and, therefore, a meadow ought to be pastured for at least two seasons after it is laid down, before the water is let upon it. For pasturing stock, sheep are to be preferred to cattle, because they are lighter, and consequently less apt to poach the ground,—which in all pasture fields, but especially in meadows, ought to be carefully guarded against;—they eat closer, and more uniformly over the whole meadow,—their droppings are distributed over the surface more equally than those of the cattle,—and they do not produce those gosky tufts, which are always formed, and left neglected, where cattle pasture.

The improvement of the grass on water-meadows, whether it be natural or artificial, is greatly improved by pasturage, conjoined with irrigation, and both modes are much assisted by top-dressing; which, although not indispensable, acts perhaps with as much effect, when resorted to in meadows, as in tillage lands.

In irrigation, much depends on the quality of the water, more perhaps than on the quality of the soil. Water, even in the purest state in which it can be found, is an enricher. Spring-water uniformly produces the earliest bite, and calcareous springs the best grass. Water in which flax has been steeped, and which the farmer is often puzzled to get rid of, without polluting the streams in his neighbourhood, forms a superior substance for irrigating; but, in short, the more abundantly water is impregnated, either from running through a track of rich soil, or from receiving the refuse of towns and manufactories, or even from being exposed to mixture with putrid substances (and so becoming putrid itself), in ponds or in reservoirs, so much the more are its effects beneficial; and it has been frequently remarked, that no watering is so enriching as that which is given in summer floods.

It may, however, be proper to mention, that summer watering is very apt to produce the rot in sheep, which should therefore be sent to the meadow in spring; and as the hay is, by many, considered to be injurious to the wind of horses, it may perhaps be most prudent to consume it by sheep and cattle.

Although top-dressing proves highly beneficial in improving water-meadows, and rendering them productive, it is unnecessary to lay on expensive composts, because the scourings of ditches, and such like materials, mixed with lime rubbish, without the addition of manure, are ascertained to be as effective for this description of grass, as any other substances whatever. If the meadow be annually irrigated, and top-dressed once in four or five years, it will continue in the highest order, and produce heavy crops of grass, —the sward will become close,—the grass sweet,—and the constant care which a water-meadow requires, as well as the expence of top-dressing, will be amply repaid by the increased production.

2. *Natural Pastures.*

Mountainous districts, haughs, or meadows of natural grass, and the sandy lands along the coast, provincially termed Links, are better adapted to pasturage than to any other purpose, and the rearing and grazing of cattle and sheep, especially the latter, is the most profitable mode in which they can be occupied.

As it is obviously impracticable to cultivate the mountains to profit, the improvement of the pasturage upon them becomes the more necessary, and this may be effected in a considerable degree, 1. By surface-draining and watering; 2. By liming; 3. By burning the plants; and, 4. By raising shelter.

Drainage contributes very materially to the improvement of pasture lands, by carrying off all superfluous water, and so preventing the grass from being thrown out in winter, and the food from being locked up by ice during frost: but, while the drainage is going forward, the application of the water, which is thereby collected, to a useful purpose ought always to be kept in view; so that, instead of being an impediment to, it may be rendered the means of, improvement.

In some parts of Scotland it has been long the practice, on the declivities or sides of hills, to form a rude sort of catch-work, by confining the water flowing from mountain springs by a small dam, built across the current; and, as soon as the first dam is overflowed, the water is retained by another raised some yards below, whereby a second small piece of ground is covered. These patches produce a large flush of valuable grass, even in the driest season, and prove of great use, especially when the rest of the pasture is parched by severe and continued drought.

It is also observable, that wherever these dams are formed, or wherever a rill is directed properly, and not permitted to fall too rapidly, the heath is extirpated, and fine pasture is obtained in its stead. If, therefore, natural springs, the water collected by drains, or mountain rills, be conducted by small cuts or gutters along the sides of the hills, and permitted to flow down them, the same effect will follow, and a variety of sweet and wholesome grasses will be obtained, and the mountains be covered with verdure, at a very moderate expense.

This mode of watering is now well understood, and it is practised with much success,—it is a speedy and a permanent method of improving hill-pasture of every description, and were small premiums or allowances to be given to the shepherds in pastoral districts, according to the extent of conducting lines formed by them for the purpose of watering, a source of beneficial amusement during the large portion of their time, at present passed heavily in listlessness and inactivity, would be furnished, and their own usefulness, as well as the interest of their employers, promoted and extended.

Some sheep-farmers have no doubt been led away by an apprehension, that the grasses produced by this watering must be of a spongy nature, and therefore unsound; but this apprehension seems a good deal imaginary, because, even were the grasses so raised to be of a soft description (an opinion, however, which experience does not sanction), the sheep are not confined solely to them,—they would only form a small portion of the food, and their effects would be counteracted by other plants in the pastures, to which the animals would be directed by natural instinct. It is believed that pastures which have been irrigated, are only unwholesome for sheep when they are the only food, or, at least, when they form the great bulk of it, and the comparatively small extent to which the practice here recommended can be carried, is sufficient to remove any fears of the nature of those here alluded to.

The effect of Lime in extirpating heath, and producing white clover and sweet grasses, has been long known; but in most situations, the extent of surface, the difficulty of access, and the consequent expence, must prove insuperable obstacles to its general application to hill-pasture. When, however, lime can be supplied at a moderate expence, it should be liberally resorted to, and the benefit of surface-dressing with it will be very soon apparent.

Besides extirpating heath and coarse herbage, and bringing up white clover, lime has the immediate effect of sweetening pasture-grass. Cattle are fond of grazing where it has been used, and it likewise predisposes the grounds to receive the full benefit of the animal dung which is dropped upon them*.

Various descriptions of hill-pastures, particularly where they principally consist of heath and coarse benty plants, may also be much improved by frequent burning. Burning should take place early in April, provided the weather will admit of its being accomplished,—it clears away the old decayed herbage, and so encourages the young and tender plants to spring up. After burning, the ling-grass rises with great vigour, and so does the young heath, which is, in many places, extremely useful for sheep and cattle; the former, in particular, are fond of it, and when the green pasture is covered with snow, heath is easily got at, and it then forms the principal part of their food. If the nature of the soil be not such as to produce grasses of a nutritive quality, the heath had much better be retained than exchanged for moor-fog, and useless and insipid herbage, totally unfit for pasture, and, by burning, its value and usefulness are greatly increased.

This species of improvement, however, will probably be objected to, as destructive of game; but if the testimony of shepherds and others, who are in the daily practice of seeing game at seasons when sportsmen are not in the hills, or paying much attention to it, is to be relied on, this objection appears to be unfounded, because the fact seems to be, that game is more abundant betwixt the burn and the bush, as the country people express it, that is, where there is a patch of green or burnt land, and a patch of heath, than in a uniformly close cover.

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* See page 189.—Ed.

The last mode of improving hill-pastures to be here noticed, is by raising Shelter, and, in this view, the benefit of plantations in the shape of clumps and belts, is incalculable.

Every description of shelter promotes vegetation, "by elevating" (as is stated) the currents of air, so that the rays of the sun penetrate more freely into the earth, and from the same cause the heat is not so quickly carried off in cold weather." This purpose is answered very completely by plantations, for they not only elevate the currents of air, but they also break and disperse them, so that such currents are rendered, in a great measure, harmless. The good effects of a very slight degree of shelter are observable. It has been long remarked, that if pasture fields are left rough in autumn, and not pastured in winter, the vegetation of their herbage appears earlier in the following spring than when eaten bare by cattle, and deprived of a covering. And this is the foundation of the system of Rowing, as it is called, in some parts of England, where the cattle are removed at an early period, that the old grass of the former year may protect the new of the ensuing. It has also been remarked, that, if eaten with sheep during winter, the grass is later in appearing the subsequent season. Even a coat of snow affords shelter, and the most superficial observer knows that land, after being covered with snow, produces a better crop the following year, than if it had been subjected to naked frosts. It will perhaps be argued, that snow may contain enriching matter as well as rain-water, and that its beneficial effects are attributable to that cause; but even when the ground is only partially covered, as in the case of stones turned up in trenching, and left on the surface during winter, the effect is the same, and can only be traced to the shelter which these stones supply. In the highest districts, larch and various other kinds of trees will grow and thrive; and, independent of the shelter which a plantation formed of these affords, the heath, without any further operation, disappears, and fine sweet grass rushes up in its stead. The inclosures can be formed, at a very reasonable rate, of feal, and in a few years the plants are beyond the risk of injury from sheep which may be then admitted, and even small patches of ground may be turned up, and railed in with the thinnings of these plantations, so as, in time, to furnish some winter food.

In these high districts, and, indeed, on thin soils of every sort, sheep are a safer stock than black cattle, and they are the only stock which ought to be kept where summer-herbage is generally scarce, and where green crops for winter food cannot be cultivated. To sheep, the benefit of such plantations as are here recommended, is obvious. In snow-storms, sheep will always find shelter, and almost always food there; and, being protected from the cold and stormy winds, they will feed in comfort, and thrive much better than in richer pastures where shelter is wanting.

Another description of natural grass, but of very limited extent, is to be found in the small meadows or haughs which lie along the banks of rivers and small streams—the greater proportion of grounds in that situation is kept under the plough, but some parts are occasionally overflowed, and these the farmer is afraid to cultivate, lest the crop should be injured, and the soil be carried off, by the sudden rise of the bounding streams. On such meadows little improvement can be made and little is required, for, by the overflowing of the water, the soil is enriched, and the quantity of herbage is not only encreased, but the quality improved; it is more nourishing than artificial grasses of a few years' standing. Cattle are fond of and thrive well upon it, and it continues green and palatable when that in other places becomes hard and dry. In such situations, the only thing requisite to procure the full advantage of the produce, is to keep the land dry when the water is not over it; for although it may seem inconsistent to recommend so strenuously the complete drainage of grounds which are liable to be overflowed, the experienced agriculturist will discover no such contradiction. He is well aware that water judiciously spread over the surface as a manure, is an enricher of the soil, and an encourager of vegetation; while water in the subsoil, or diffused through the substance of the ground, and bursting out in the shape of bogs and spouts, is its bane and greatest enemy.

The sandy lands or links along the coast, are in many places extensive, and afford sustenance for sheep, and for small breeds of cattle, but in most places, in Scotland at least, they are generally of little value. Composed almost entirely of sand, a very scanty herbage, consisting chiefly of rough benty grass, is raised upon them; and, from their being liable to be covered with blown sand, they cannot receive the full benefit, or repay the expence, of an ordinary top-dressing, which has consequently been seldom or never tried upon them. The improvement of the grasses on this sort of pasture, has therefore been neglected, and the droppings of the scanty stock to which they afford a very poor subsistence during summer, can have little effect in promoting vegetation; but were sea-ware, which is almost always to be had at some seasons of the year, in such situations, collected and applied liberally to the surface, there is no question that such a stimulus would thereby be given as would increase, as well as improve, the produce at the smallest possible expence. It has been long observed that the links which produce the most luxuriant herbage, and the closest and sweetest pile of grass, are those composed of shelly sand, from which they no doubt derive their extraordinary fertility; and, as in many places on the coast, there is found such a species of shell sand, possessing many of the qualities of lime, there is good reason, judging from analogy, to conclude that it may operate very beneficially, when applied to the surface of ordinary links, and be productive of permanent benefit.

In some situations the links are wettish, in consequence of the difficulty of carrying off surface water, as well from want of declivity as from the extent of sand-hills thrown up by the action of the sea. This evil is partially remedied by introducing the plough, and forming the links into pretty high ridges; but such grounds generally produce sour and unwholesome grass, and are not considered sound pasture, especially for sheep.

3. *Tillage Lands.*

In considering the improvement of the grass on tillage lands, certainly the most material branch of the whole, it will be necessary again to advert to, and offer a few remarks and hints on, the preparation of ground intended to be laid to grass, for on this the success of the future attempts at improvement mainly depends; and although these observations may contain nothing new, and appear, as in fact they are, a repetition of what has often been more ably pointed out, and recommended by many eminent agriculturists, still the recapitulation may not be wholly useless even to experienced farmers, and may prove in some degree beneficial to beginners.

Pasturage is the common mode of using grass: in many soils it cannot be consumed in any other way, and in general it must be considered the best mode in which live stock can be fed and supported. The system of soiling is no doubt most advantageous in many situations, but in others it is both unprofitable and inexpedient; and in upland districts, and on thin soils, the grasses are so unfit for cutting that they will not defray the expence of it. Neither are the grasses best calculated for good pasture best fitted for being mowed and used in a green state, so that at the very commencement of the operation, a different mode of treatment is required; but in an improved system of management, great benefit is derived by grazing for a moderate time lands which have been long in tillage, and in the neighbourhood of the residences of proprietors; or in situations where there is a steady demand for grass-fields, the land may be laid to permanent grass, and prove both ornamental and profitable.

In order to secure, however, the full benefit of the grass system, it is indispensable that the ground, whether intended to remain in grass for the usual period in an ordinary rotation, or for a longer space, and supposing always that it has been thoroughly drained, without which any other preparation is so much useless labour, should be made as clean and as free of weeds of every description as possible. There never can be good grass or fine pasture on foul land. The roots of couch grass, thistles, fern, broom, and all other noxious weeds should therefore be carefully removed, otherwise they will soon get above, and destroy much of the young grass, besides mixing with it, and injuring its quality, if cut either green or for hay. The land ought also to be laid level, and completely pulverised, and sown down in moist weather, and in good order. To effect this object in the best style, and if permanent pasture is wanted, the land ought to be summer fallowed, and, after a moderate dunging, sown out with grass-seeds *alone*, about the end of August. The roots will then have time to establish themselves before the winter frosts set in, and the growth will not be such as to render pasturage on it necessary for that season.

In laying ground to grass, the complete pulverization of the soil ought to be most scrupulously attended to. If this operation be not carefully performed, the seed must be sown very unequally, both in depth and breadth, and cannot be expected to spring fairly and uniformly, for parts of the surface will be covered with clods, which hinder the seeds from falling on these spots, and so occasion blanks, and if, by the action of the harrow or the roller, the clods are broken or moved to other places, the seeds which they cover are then buried, and are unable to vegetate through them. To accomplish complete pulverization, some farmers are in the practice of rolling their fields *before* and *after* sowing grass-seeds, and they concur in representing this mode of treatment as extremely beneficial in producing an equal and uniform braird.

In alternate husbandry, a crop cannot be sacrificed for the purpose of procuring superior grass ; but a very good preparation for grass-seeds, especially in light soils, is turnips or potatoes, which have been well manured, and kept particularly clean. If the turnips, or part of them, have been consumed on the ground by sheep, the preparation is the more complete. Barley is certainly the most eligible crop with which to sow grass-seeds, and they ought not to be put into the ground, if it can be avoided, with oats or with wheat. Both are longer in the ground than barley, and therefore prevent, for a longer period, the plants from enjoying the benefit of the sun and free air ; and, when clover is sown in the spring on wheat, the soil, which has previously been months without being stirred, forms an improper bed for it, while the wheat overtops and choaks it from the very beginning.

Much has been written, and much discussion has taken place, on the various kinds of grasses which are considered most productive and nutritious. In a late publication by Mr George Sinclair (Hortus Gramineus Woburnensis), a mixture of nearly twenty different species of grass-seeds is recommended for permanent pasture, and an equally extensive assortment for raising grass in alternate husbandry, while much able reasoning, and many specious arguments, are advanced in support of the combination. It certainly stands to reason, that a mixture of the seeds of such grasses as are found to prevail in the best pastures, when fully established, is likely to produce a closer sole, and at an earlier period, than the seeds generally sown, because years are required before the natural grasses come in and establish themselves, and, in the mean time, noxious weeds are apt to take possession of the ground, and exterminate the clovers. Many eminent agriculturists accordingly use various combinations of grasses with great success; but it is much to be feared that this system is too complex and too expensive for general practice. Such experiments are highly praiseworthy,—the information so obtained is interesting to the community, and the result may be profitable to the wealthy agriculturist. It is in vain, however, to expect that the ordinary class of practical farmers either can afford to purchase those seeds, or bestow the time and attention requisite to succeed in raising them. Indeed almost every sort of grass, at some time or other, has had its patrons and its advocates, but in soils which will produce crops of rye-grass and clover in perfection, no one needs persevere with any other; and the fact, that, in this age of enterprize and improvement, and after all the other grasses have been fairly tried, a mixture of red and white clover and ryegrass is almost universally sown in the tillage lands of Scotland, is sufficient to prove that those grasses are best calculated for our climate and the generality of our soils.

The quantities and proportions of those seeds to be sown must be regulated by the nature of the soil, and the use to which the produce is to be applied; but as it is better to have the ground well stocked with plants from the outset, than to wait the gradual spreading of the clover, it will be found a good general rule not to be sparing of seed. A pasture field cannot be too thickly planted; and, if pasture should be the object, a considerable proportion of white clover should be allowed; if soiling, then red clover should predominate;

and if hay, there ought to be great abundance of ryegrass seed.

In procuring grass-seeds, especially for sowing in pasture lands, greater care should be taken in the selection than is commonly done. Annual ryegrass is frequently substituted for perennial, and the grass crop is consequently much injured; and if intended for pasture, it is in fact destroyed by the use of the former. Indeed there can be no greater improvement on grass-lands than the introduction of the best varieties of ryegrass; and every farmer and every cottager ought to spare no pains in procuring the kind which suits his soil and his climate, and in preserving it in a clean and a pure state, when he has succeeded in obtaining it.

Should the grain-crop turn out a heavy one, early cutting will be of much service to the grass, which will sustain considerable damage by such a crop being allowed to stand even a few days longer than is absolutely necessary. The strength of the crop in which they are sown regulates the success of grass-seeds, in spite of all the care that can previously be taken, and there is frequently greater danger of the young plants being smothered by the grain-crop than there is benefit derived from the protection which it affords. If the autumn is dry, and the young grass very luxuriant, it may be eaten a little, but only with young and light cattle, before bad weather sets in; and it must not be poached, neither must sheep be allowed to get on it, however dry the ground may be, the first year, as they will destroy the broad clover entirely. The ground should also be cleared of such weeds as may appear, and be well rolled before winter, and again before stock is admitted the following season; and every year, all weeds that spring up in spite of the stock should be cut down before they get into seed.

It may be here remarked, that the roller is an implement of great utility in husbandry, and in no branch of it more so than in the cultivation of grass. It renders the soil compact and solid; it encourages the growth of the plants, by bringing the earth close to every part of the root; it assists in filling up and levelling any inequalities in the surface of the field, thereby preventing surface water from remaining stagnant, and eradicating the grass from particular spots; and it tends to hinder the drought from penetrating, which is an effect of the utmost importance. In fact, a grass-field cannot be too often rolled; and it is not going too far to assert, that the application of the roller in autumn to prepare the roots for resisting the winter frosts, and in spring to firm them after these frosts, every year while the field remains in grass, will amply repay the expence. It is also material not to confine the eradicating of weeds to the field itself. The sides of dikes and hedges, and of turnpike and other roads and lanes, are fruitful nurseries of weeds, which, in these situations, should be pulled up or cut, and every precaution ought to be taken to prevent them from ripening their seed. Should rushes or flags make their appearance in pasture fields, it then becomes indispensable to trench that part of the ground about eighteen inches deep, and to sow it out afresh after due preparation; the hard subsoil on which those plants delight to fix is thus removed beyond their reach, and, as the roots cannot establish themselves on dry ground, nor penetrate downwards so far as the subsoil, the cure is generally complete.

But even after the soil has been put into, and laid out in the best condition for producing grass, and after complete success has attended the endeavours which have been used for that purpose, it is nevertheless necessary to keep up the fertility of grass grounds by different precautions and applications, of which grazing and top-dressing may be reckoned the principal, and shelter a very powerful auxiliary.

Many soils require to be long grazed, not so much on account of profit, as to renovate them, and render them capable of paying for tillage. Land which has been completely run out, by repeated cropping, and the last scintilla of vegetable matter coaxed out of it by the application of a small portion of dung, (for without some manure, land cannot be effectually exhausted), can only be brought round, by getting a full allowance of dung, to enable it to support plants, and by being thrown into grass; but such ground will not keep grass without surface dressing, and no more effectual top-dressing can be applied than one of clay before winter. The clay is crumbled down by the winter frosts, and being washed to the roots of the plants, it not only forwards their growth, but invigorates and begets fertility in the soil. The dung of the larger sorts of pasturing cattle being allowed to dry on the surface, is generally so much wasted as to have little effect in improving the grass; but if sheep are introduced (as they ought to be, whenever good grass is the main object), the season after the grass-seeds are sown, the advantage of this mode of occupation is very apparent. Indeed, in thin soils sheep, as the ordinary stock, are more suitable than cattle, because they will thrive where cattle would starve; and in such soils, therefore, they ought to be brought back, for some time at least, whenever the grass begins to fall off. In lands improved from furze or broom, sheep should also be occasionally kept, because, being fond of these plants, they eat them greedily, and prevent them from rising amongst the grass, which they are very apt to do, and in no other way can they be so easily and effectually kept under. After sheep have been removed a short time from pasture fields, cattle are observed to prefer the grass, and to thrive well upon it. It has often been objected to sheep, that they bite too close to the root, and sometimes tear up the young plants altogether, but this only happens when too many are laid upon the field, or kept too long upon it, and with any other stock in similar circumstances, the effect will be nearly the same. The error is in keeping on a stock which the pasture cannot maintain; for sheep, though fond of a short bite, will not tear up the plants while they have abundance of food; and it is only when the food becomes scarce, that, for subsistence, they are compelled to eat so close.

When pasture is the object, the scythe should never be seen in the field; and, to keep pasture fields in proper order, it is advisable not to put the stock on too early, nor to allow it to remain too late, particularly in wet seasons; and it is also of much importance not to overstock them. If a full stock is put to grass in the spring months, and a backward season sets in, the cattle, in place of feeding, barely subsist; but, if a light stock is put on, they are sure to feed well, and by June the grass is so far advanced, that it commonly holds out all the season. To overstock is almost the greatest error of which a farmer can be guilty; and it is a practice which has accordingly been denounced by every good writer on agriculture.

Mr Brown, in his excellent Treatise on Rural Affairs, very strongly and very justly reprobates it. He says, that if pasture fields are eaten bare, and exposed to a hot sun, or scourging wind, the roots of the plants are enfeebled, and prevented from flourishing, while the surface, deprived of a cover, whereby it may be warmed and fructified, continues barren and unproductive. When artificial grasses grow languid, their place is supplied by the aboriginal inhabitants, —moss-fog obtains possession of the surface, and puts ground into a worse condition, when ploughing is again attempted, than it was when grass-seeds were sown. Considerable judgment, he adds, is necessary to manage grass-lands, so that the soil may be improved and the occupier benefited. The last cannot be accomplished, if the first be neglected; but to keep a full bite is always a good and a safe maxim.

It is, however, by top-dressing, in conjunction with pasturage, that grass-lands are most eminently improved; and the benefit of this application is perceptible, not on the grass alone, while they remain in pasture, but in the grain crops, after they are again brought under tillage. Whilst in grass there is an increase of produce, which furnishes food for additional stock; the droppings of this additional stock yield a further supply of manure, in the benefit of which the grain crops participate. Of the advantage of top-dressing to grass-lands the English farmer is fully sensible. In the end of August he carries out all the putrescent matter he can collect to spread on his meadows, and the effect is apparent in the beautiful verdure with which the grass-lands in England are covered; an effect attributable not so much to superiority of soil and of climate, as to top-dressing with manure. But, besides putrescent matter, very effectual top-dressings may be formed of various substances. If the land has not been lately limed, a considerable quantity of that manure, which is extremely favourable to the production of the finer grasses, may be applied, particularly in strong soils, to good purpose; and if grass land be clean, lime may be laid on it as efficaciously as upon the best wrought fallow. If some good earth can be procured to mix with the lime, the effect will be increased,—moss-fog will be extirpated,—the white clover will spread,—the blanks on the surface will fill up,—and a close sward be the consequence.

If the ground has been lately limed, or if the soil be thin, a mixture of earth and dung, composed of the ashes and sweepings of towns, if they can easily be procured, or of farm-yard manure, makes a very good dressing,—and long dung like lime, is a certain cure for moss or fog; but good earth, saturated with the urine of cattle, excels every other compost that can be laid on grass. Should such compost be applied, even in the middle of September, by which time all top-dressings ought to be laid on, the effect is apparent the same season, and one can distinguish, at a very considerable distance, the part of a field which has been treated in this way, by its superior verdure. In the following spring, the dressed part shews itself by its early appearance and growth, and it maintains its superiority throughout the season.

The importance of saving the urine of cattle, for the purpose of manure, has justly been a favourite theme amongst the greatest agriculturists, but in no way can it be turned to such advantage, as by fitting earth to form a top-dressing for grass. Even when applied alone, and without any admixture, it improves grass to a high degree, and with little trouble, and as little expence, every farmer has the means of keeping up the fertility of his grass-lands, without robbing his other crops.

It is also a pretty general opinion, that the best mode of applying marl is to lay it on the surface of grass-land in the end of harvest, or during the winter, one year, or perhaps two, before the land is broken up. After marling in this way, a great increase of grass appears the following summer, and, when the ground comes into tillage, the crop of corn is uniformly excellent.

The refuse of soap, or soaper's ashes, and even soap-suds, or soapy water, may also be used to good account, as may lime-rubbish of any kind, and soot, although it be some time after the application of the latter before cattle will relish the grass; but, in short, every kind of earth and manure, applied to the surface of grass-land, is productive of beneficial effects.

Another very valuable resource for top-dressing, in situations where it can be procured, is the sea-weed or ware driven on the coast, after violent gales and sea-storms. When this substance is spread on the ground fresh from the shore, it causes the grass to rise luxuriantly, without promoting the growth of weeds,—a quality peculiar to this species of manure. It destroys the fog, it makes the grass spread, and it raises a good sward of grass on grounds which have been but indifferently laid out. Indeed, too little attention is paid, in many places, to this valuable substance, whether as a material for top-dressing, or as a desirable addition for general purposes to the farm-yard dung. The shelly sand, before mentioned, is likewise an admirable top-dressing, and possesses, in a slighter degree, the qualities of lime; so that, in situations where it can be procured, at a moderate expence, it ought to be liberally applied.

When there is a sufficient command of water, pasture fields may be improved by simply passing the water over them, without their being formed into water-meadows; and, if the water is of an enriching nature, or allowed to mix with putrescent substances, so as to be let on in a putrid state, the benefit of the application will be much augmented.

In alternate husbandry, where the fields are only a short time in grass, it cannot be expected, neither is it at all necessary, that the same trouble and expence should be bestowed on the grass-lands, as when they are intended to remain for years in pasture; but, even after a crop of hay has been cut, and the aftermath also mowed and carried off, the application of any of the top-dressings here recommended will add amazingly to the produce of the second year; and where top-dressing can be procured, without trenching on the farm-yard dung, it ought never to be neglected, or to be sparingly applied.

In arable lands, as well as in upland pastures, the shelter of the ground merits much attention. To form belts of wood along the sides of the fields is, in the highest degree, ornamental, as well as beneficial. It is an improvement which may be begun at any period, however late, of man's life, because the growth of trees, even in their earliest stage, is highly interesting, although the planter may not have a prospect of living to see them become of much use. Graziers, and others in the practice of renting grass-fields, justly appreciate the value of this improvement, and evince their sense of it, by cheerfully paying a higher rent for such fields as are so accommodated.

Besides promoting the early growth and the quantity of the grass, the stock are protected by the shelter in cold seasons, and by the shade in warm, which these belts afford.

In all sorts of weather the cattle are kept comfortable; and, instead of standing at a bare dike-side, shivering with cold, or galloping through the field, mad from excessive heat, unable to settle, or to eat their food, they feed, and lie and ruminate in quietness, and at their ease; and by so enjoying the full benefit of the grass, they improve in condition every day.

Many eminent improvers are ready to admit, that the additional value of their grass-lands amply compensates the loss of ground, and the expence of forming clumps in, and belts along them; while the ornament, the conveniency, and even the profit of the timber which grows in these belts and clumps, afford additional incitements to proprietors to extend the practice, the good effects of which are not limited to grass-lands alone; but, by preventing the bad consequences of cold and blighting winds, and the shaking of the grain crops, prove highly beneficial to every other species of crop which such lands are capable of producing, and contribute, in a high degree, to beautify the country, to increase its produce, and even to ameliorate the climate itself.

1st November 1825.

Essay II.—*By Mr* William Stronach, *Marnoch, Banffshire.*

Although the practice of top-dressing land is particularly well adapted to this country, where a great proportion of the land lies in situations difficult to be cultivated,—where, in many places, cropping is uncertain,—and where also, in almost every farm, there is some land which is neither worth the expence nor the risk of cultivation; still it is very little known at present in Scotland. The practice of the country is to crop the thinnest or poorest soil occasionally, which, though I believe to be done with a view to improvement, by laying it down again in better condition for pasture, seldom effects this end; as it frequently happens on such subjects that the different crops disappoint expectation, and after much labour, the grass, the object in view, likewise fails, if not on good ground, at least on soils of an inferior quality, or in exposed situations.

For these reasons, I would recommend *top-dressing* as the best and least expensive mode of management for such soils, by means of which the grass will be renewed, and the soil benefited. This practice, indeed, has the advantage of being always attended with success; it is within the reach of every farmer, to a greater or less degree, and the expence is very trifling.

The following outline of Rules for Practice is put in as plain a form as possible, knowing from experience, that, if any difficulty is supposed to exist, the object is neglected by many who might otherwise be inclined to make a fair trial.

I. *On the Lands to be benefited by Top-dressing.*—*1st*, Outfield or poor thin lands, inclosed or not, in order to improve the pasture, should be top-dressed, in preference to any other mode of treatment, as the surest and least expensive practice.

2d, All lands situated in places where cultivation is difficult from steepness, those at a great distance from the steading, those connected with rough ground, those having many trees or fast stones in them, should have the grass renewed by top-dressing, in preference to cultivation, which, in such cases as the above, is attended with great inconvenience as well as loss.

3d, Old pastures, where the soil has become fogged, or matted and dry, and has lost that sweetness and nourishment which stock are so fond of in old pastures, require top-dressing; and as there is nothing so valuable as old grass, these pastures should never be broken up, for it takes a lifetime to re-establish them. Every farm should, if possible, have a portion of such ground preserved by lease.

4th, Lands having wood pastures, or river or burn-side grass, inclosed together, are more valuable in grass than any other crop; as, by being broken up, the outskirts are more or less lost, which, in such situations, are particularly valuable. They can always be kept fresh by attention and top-dressing from time to time.

5th, Top-dressing is beneficial wherever the grass appears to have lost its freshness, or is open in the sward.

II. *On the Ingredients for Top-dressing.*—These are few and simple, and their choice depends on what the neighbourhood furnishes. If we cannot command the best, we must take what is always within our reach, viz. common earth, with or without lime. As there are different merits in the different ingredients, they shall be noticed in order.

1*st, Lime* is generally to be had, and is almost indispensable.

2*d, Marl,* if it be got in the neighbourhood, is most valuable.

3*d, Alluvial soil* is generally to be had, and is a very good ingredient for top-dressing. It is a rich greasy soil, generally found on low haugh ground, near water runs, of considerable depth, from which it can be taken off without injury to the place.

4*th, Moss-earth* is valuable, when of a good kind; but it is of very various qualities, and is frequently mistaken, and after being brought home at considerable expence, it turns out of little value.

By far the best moss-earth is that which is found in banks on the surface of which grass grows, generally near mosses or their outskirts; it is compact, very black, and dryish, sometimes slightly greasy. The light-coloured moss, where heath grows, generally falls into a light dusty powder when dry, and is of little or no value for any purpose. It may deceive one when wet, and therefore it should never be carried in that state, but laid out on the bank to dry, when its nature will be better seen. I would caution the inexperienced from a careless use of moss-earth, with or without dung, as I have even seen it do harm.

5th, Common deep soil or deposit is found on every farm, near the low corners, or when the ground falls to a flat. Whenever any considerable depth is found, the surface can be laid aside, and all the extra depth taken. This will generally be found in the field to be dressed, or an adjacent one; is a good ingredient in conjunction with lime; and as it is the simplest and cheapest, may be applied with great advantage.

6th, Scourings of ditches, road-sides, old dikes, &c. These are useful, but as they require a little longer time for preparing, they must be provided accordingly. Advantage may be taken, by opening new drains, and cleaning old ones, in the field to be dressed; and these drains may remain open while the field is in pasture.

III. *Method for Practice.*—When pasture falls under any of the before-named denominations, and top-dressing appears necessary for its improvement, we must make choice of that one of the ingredients described which can be most conveniently got.

Let any spare time, even before harvest, be applied to the collection of the substance. If of a toughish or *gosky* nature, such as from ditches, dikes, &c. the sooner the better, as it will require two turnings in the heap with lime; but, if alluvial, or common soil, without any surface, it will be in good time after harvest. If the ground from which the soil is to be taken be of any value, the surface can be laid aside to replace again. Cart off and lay down the soil to form a heap on the ground to be dressed, of six loads width, whenever a day can be spared for the purpose. After a few rows have been laid down, get a few loads of lime, laying down a load of lime for every twelve of soil, on each side of the heap, for convenience in mixing; and let the heap be formed from one end regularly, as far as the lime will extend; and then delay until there be a fresh supply of ingredients for repeating the operation, until the heap contains about eighty loads of composition. When one heap is finished, let another be formed near it, unless more than one may be carried on at the same time. These heaps of this earthy description may be accumulated in different places, till the middle of January. One turning over before putting out will be sufficient for them, and it will be found that the lime used will by that time have swelled or fermented the heaps. Such heaps as these should cover about an acre. They must never be spread thinner, or the desired effect will not be produced.

Any gosky or toughish ingredients must be put into heaps by themselves, as they require more time, rather more lime, and a second turning before putting out, and the lumps properly broken at the same time.

Moss earth may be treated as above for common alluvial deposit, but ought to be collected immediately after harvest, till the end of December, as it requires to remain rather longer in the heap than the common earth. A load of lime may be given to about ten of the earth.

IV. *Putting out and Spreading.*—Let a frosty day in the beginning of February be chosen for carting out the heaps, and laying down for spreading. Let this be done along a rig, which should be regulated by pacing, so as to shew the proportion of an acre for each load, which should cover about two roods or falls, at the rate of eighty loads per acre; or by pacing, say seven paces down a five pace rig. It is always advisable to put it out rather thick than otherwise,—the soil ought to be covered so as to conceal the grass at a little distance. After the small heaps have been spread out for a few weeks, and have got the benefit of a little frost and wet, the ground should be rolled to break the lumps; and a brush harrow can be attached to the roller from its back, for spreading the lumps after being broken by the roller.

The full benefit of top-dressing must not be looked for sooner than the end of the summer or following spring, by which time the grass will be much greener, and eaten closer by the stock. This effect will continue for many years. The ingredients for top-dressing which were noted as requiring longer time in the heap, might, with propriety, be collected in some spare corner or part of any field adjoining to that to be dressed, as by being laid down on the pasture immediately before or after harvest, it might disturb the stock grazing. The other kinds, being deposited in October, November, and December, can have no such tendency.

Lastly, The great secret of having good grass is not to crop the land too severely, but lay it out in good condition with lime. When grass-lands of the description before given for *being top-dressed* are once well laid out, I think they *ought* and *can* be kept improving.

Experiments and Trials made.

Experiment 1.—*In* 1822 *and Spring* 1823.—Top-dressed a poor field at a distance from the steading, that had been five years in grass, and was getting dry and hard. Used moss earth found in the bottom of some field,—collected six heaps, containing about seventy loads each of the earth, and six of lime; covered nearly ten acres of surface, but it was too thinly spread, and soon disappeared. The moss used for the purpose was likewise too light and spongy after being dried, and became powdery. The grass was, however, a good deal benefited, but not so much so as I expected. The expence was not calculated, as the farm establishment performed the operation, with the exception of turning the heaps and spreading them.

Experiment 2.—*In Summer* 1823.—Collected earth from road-sides,—cleaned out ditches,—and opened some new ones in the field to be *top-dressed.* These ingredients were laid down in rough heaps before harvest; some other heaps of an earthy kind were prepared from the sides of the same ditches after harvest. In all five heaps laid down on the parts of the field most requiring renewal. Part of the ground to be dressed was poor and open in the sward, the rest dry and matted. Mixed the heaps from time to time with lime, giving the toughest an extra quantity, and breaking lumps. These heaps were again turned two weeks before the others, with a little more lime, say equal to about ten loads of earth for one of lime. These heaps were put out over a surface of about five acres, and appeared thick enough: it was then rolled and harrowed.

The effect of this was much better than the former, though some of the lumps did not seem to be sufficiently reduced. In the month of August following, the grass in this field, where the composition had been applied, seemed much fresher; and the following spring it was much earlier and fresher, and the field brought a very considerable rise of rent.

The expence, as in the former case, was merely for lime, and the labour of turning and spreading.

Experiment 3.—*In Autumn* 1824.—Opened a bank of rich earth in the end of the field to be top-dressed,—laid aside the surface carefully, by rolling up the turf. Collected three heaps where required, containing about seventy-four loads of earth and six of lime; mixed the earth and lime in the manner before described under that head; turned the whole again in January, and put out in the beginning of February rolled and harrowed. The improvement was greater than could have been looked for, considering that the ground chosen was the worst in the field. The work was performed in the space of about five days for gathering, and the same proportion for the other operations; but the whole is here reduced into a short view *of one day's work.*

Gathering, 14 Men, 14 horses, one short day,	L. 0	0	0
———— 9 Men, hired for assisting, ditto,	0	11	3
Mixing, 9 Men, hired for mixing with lime, ditto,	0	11	3
Turning, 8 Men, turned the whole piece, at	0	8	0
Driving Out, 15 Men, 16 horses, ditto,	0	0	0
Spreading, 7 Men, hired,	0	8	9
Rolling, 2 Men, 2 horses, rolled and harrowed, ditto,	0	0	0
	L. 1	19	3
Lime used for mixing, 18 loads at 7s. 10½d.,	7	2	6
For real outlay of money,	L. 9	1	9

On the horse-work little could be counted, as convenient times were chosen. The extent of ground was fully three acres of land, improved from bad to good ground.

Nov. 1825.

Essay III.—*By Mr* James Jackson, *Penicuik.*

Extract on Top-dressing Moorlands with Lime.

It is a well known fact, attested by uniform experience, that all moorish grounds in our island, at whatever altitudes they may be placed, are little, or at least not visibly, improved in their herbage or condition by the dung of animals, either dropt or laid upon them. The foundation of their improvement for pasturage must be laid by a good application of calcareous or other stimulating substances, even although these substances of themselves should contain no nourishing ingredients; nay, it is rather necessary that they should act as a poison upon the existing barren herbage, and, by accelerating its decomposition and putrefaction, ultimately convert it into the food of other grasses of a richer and more nourishing quality. The object, therefore, of this section, is to point out the means by which this most valuable object can be accomplished. In wet moorish soils, however, before any dressing is applied, drainage is absolutely necessary to relieve the soil of its wetness. In many, or perhaps in most situations, open, or what is termed sheep-drains, will be found sufficient for the purpose. As these, however, when the drainage is necessarily close, will materially abridge the pasture surface, drains formed beneath a sod which is afterwards relaid, are certainly worthy of the additional expence which they require. The soil being thus prepared, a proper dressing of lime, or of materials having that substance in their composition, applied to it, will ultimately have the effect of completely destroying the native coarse herbage of heath, bent, moss, &c. and raising in their place a sward of white clover and sweet natural grasses. Nor is this its only benefit. That matting of tenacious roots, which in a manner composed the soil, and kept it in barren torpidity, is rotted down by it into fine vegetable mould, affording a rich virgin soil for the nourishment of its new vegetable covering, and qualifying it forever afterwards to receive benefit from the dung of animals, or other substances scattered upon it, either by natural or artificial means. Indeed, for all soils in a state of nature, "containing acids or ferruginous salts," "calcareous matter is absolutely necessary to bring them to fertility." I shall, however, illustrate the truth of these remarks, by adding experimental detail to theoretical assertion.

The first experiment I shall adduce is on the farm of Kingside, on the extensive estate of Colin Mackenzie, Esq. of Portmore, county of Tweedale, parish of Eddlestone, which, from its high exposure (about 1100 feet above the sea), is commonly called Kingside-edge. At the bottom of the dry ground, on the verge of a moss, lay a tract of coarse moor-ground, covered with heath, bent, &c. About thirty years ago, Mr William Purdie of Lyne, its wealthy and very respectable tenant, gave it a dressing of lime, at about forty bolls of shells per acre, with the intention of ploughing it. Circumstances, however, prevented him from getting this accomplished, so it lay over for one year without his ever anticipating a favourable change. In the second year, however, an unexpected change made its appearance. The original coarse sward of heath and bent, &c. gradually gave way, and was supplanted by that fine carpeting of rich and sweet grasses which all cattle delight to eat, and all husbandmen to see; and to this day, although thirty years since the experiment was made, Mr Purdie candidly assures me that it has experienced no diminution of its fertility, nor has it in the slightest degree any appearance of a tendency to produce moss plants, which are the bane of all high pasturage grounds. As the cause of this, he ascribes the spewings of the worms, apparently immensely numerous, which incessantly act as a rich top-dressing; the droppings of the sheep and cattle likewise which graze upon it, have the effect of enriching it progressively, thereby encouraging the repeated exertions of the worms. Mr Purdie assures me, that the sheep and cattle are to this day much fonder of it than the pasture recently sown down after the ordinary course of cropping; in which case, after a few years, it becomes sour and tasteless, and the natural coarse herbage gradually takes possession of the soil. I shall not attempt to define the cause of this difference of effects betwixt tillage and top-dressing; your Society will find it treated of in a course of most ingenious experiments in the Farmer's Magazine, March 1812, page 69. I inspected Mr Purdie's ground referred to, in December 1814, a season of the year when the low temperature rapidly engenders the growth of moss, and found it equally divested of it as the richest pasturage parks of his Grace the Duke of Buccleuch at Dalkeith House. The soil was equally plenished with a close matting of herbage, and appeared only to want shelter to make it equally valuable. The chilling temperature of a high climate, however, unavoidably retards the growth of the finest herbage, and keeps its vegetative power in lingering feebleness, until the ardour of the solar influence in the months of June and July makes it rapidly and at once rush forward into maturity; but, as the heat declines, again its energy decreases, until it gradually sinks into the sleep of a long and stormy winter. It is not so with that of a low country; its vegetation is more early, its uniform growth more ardent, and the mild winter of a low climate keeps it in perpetual verdure. I inspected the ground again on the 8th of May 1825, and found the daisy in full blow, and the other grasses rapidly advancing, and at least a week before the vegetation of those sown down after tillage five years old. I found the soil of a respectable depth, and what might be termed a free loam, of a dark-brown colour, rather inclining to moist, and resting upon a moist gravelly subsoil. Mr Purdie informs me, that the soil, in its original condition, was of the ordinary moorish mossy complexion. The whole expence of its reclamation, being forty bolls of limeshells per acre, at 2s. 6d. per boll, including carriage and spreading, &c. is L. 5. I consider these calculations moderate indeed, when he values it, three years after its application, worth twenty shillings per acre, whereas, in its former condition, it was not worth two shillings. Such a result certainly holds out great inducements to the proprietors and occupiers of such land.

The second experiment I shall take notice of, is on the estate of Wheem, belonging to Sir James Montgomery, Bart., about three miles from the last one treated of, and in the same county. Upon a large park of moorish ground, originally in the same condition as the last one treated of, but of a much wetter quality, though having the advantage of a warm shelter, a top-dressing of lime was applied, about twenty-eight years ago, by the late Lord Chief Baron Montgomery. The soil was previously drained, and the application of lime was at the rate of fifty bolls of shells per acre. The same happy result followed as in the first experiment related, and to this moment it remains in a most wholesome and fertile state. I saw it and several other improvements on this estate, which I shall take notice of in their order, in the month of July last. The grasses were then excellent, there were several clumps of rushes in the field, but I could discern neither heath, bent, nor fog It was, in fact, a field of as fine natural grass as I could wish to witness; and, since its original dressing, I am informed it had never got any other application. The lime was burned by his Lordship about half a mile from the spot, and, including all charge of carting and spreading, &c. the expence could not amount to above 1s. 6d. per boll, which will make the dressing of the acre L. 3, 15s. The extent and expence of the drainage I cannot ascertain; and as the plantations must have long since paid themselves, leaving the present trees as profit, it cannot be rating the whole reclamation of the park too low to call it L. 6 per acre; and, at this moment, I feel confident that, were the park let for the summer season only, it would bring L. 2, 1s. per acre. This is unquestionably another strong instance of the value of this method of improving the waste pasturage of our island. The barren soil of the Wheem, in its natural state, and its equally bad climate, are well known; and there are perhaps few situations in Scotland where improvements could be commenced with less prospect of success.

The third and last experiment on top-dressing with lime, which has fallen under my own observation, was at West Linton, in the same county, upon a soil different from any of the other two, it being light moorish heathy hill-pasture ground, occupied by Mr Welsh, on which he commenced a top-dressing of lime to a very large extent, about twenty-five years ago, with the sole purpose of improving the pasture, at the rate of about forty bolls of shells per acre. The operation here likewise was most complete. The heath entirely disappeared, and a fine rich sward of white clover and other grasses sprung up in its place. The expence of the lime carriage and spreading could not exceed 2s per boll, as the distance from the lime is not above two miles; and the reclamation of the acre could not on any account be above L. 5. I saw it some years after the application of the top-dressing, when in full bloom in the month of July, and the contrast of its vegetation with the surrounding herbage from which it was reclaimed, cannot be expressed.

Nov. 1825.

ESSAYS ON THE TEMPERATURE AT WHICH BUTTER CAN BE BEST PROCURED FROM CREAM.

ESSAY I.—*By the late* DR JOHN BARCLAY *and* MR ALEXANDER ALLAN.

EXPERIMENTS to ascertain the temperature at which butter can be best procured from cream, were commenced on the 18th of August 1823, and were conducted in the following manner.

First Experiment.

Fifteen gallons of cream were put into the churn at the temperature of 50°, the weight per gallon having been previously ascertained to be 8 ℔ 4 oz. * By agitating the cream in the usual manner for the space of two hours, the temperature rose to 56°; at the end of churning, being four hours from the commencement of the operation, the temperature was found to be 60°, or 10° higher than at the commencement. The quantity of butter obtained in this process was $29\frac{1}{2}$ ℔ avoirdupois, or nearly 2 ℔ of butter for each gallon of cream put into the churn. The butter appeared to be of the very best quality, being firm, and rich and pleasant to the taste. A gallon of the churned milk being carefully weighed, gave 8 ℔ 9 oz., being an increase in weight of 8 oz. per gallon above that of the cream used in this experiment, or an increase in weight of 5 oz. per gallon above that of water at the same temperature.

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* It is to be understood that the gallon measure used throughout these experiments contained exactly 8 lb. 4 oz. of Edinburgh water at the temperature of 60°. The weights used were Avoirdupois, and the thermometer was of Fahrenheit's scale.

Second Experiment.

26th August 1823.—Fifteen gallons of cream were put into the churn at the temperature of 55°, the weight per gallon being 8 ℔ 2 oz. By agitating the cream, as formerly, for one hour and a half, the temperature rose to 60°; at the end of churning, being three hours and fifteen minutes from the commencement of the operation, the temperature was ascertained to have increased to 65°, or 10° higher than at the commencement. The quantity of butter yielded in this experiment was 29 ℔ 4 oz. It appeared to be of an excellent quality, and was not sensibly inferior to that obtained in the first process. A gallon of the churned milk weighed 8 ℔ 8 oz.

Third Experiment.

29th August 1823.—Fifteen gallons of cream were put into the churn at a temperature of 58°, the weight per gallon being 8 ℔ 2 oz. At the end of an hour's churning the temperature had risen to 63°; and at the end of the process, which lasted three hours, the temperature was found to be 67°, or 9° higher than at the commencement. The quantity of butter obtained by this experiment was 28 ℔, and in quality it seemed to be rather inferior to that produced on the 18th and 26th of August, being rather soft and spongy. A gallon of the churned milk weighed the same as in the second experiment.

Fourth Experiment.

4th September 1823.—The same quantity of cream was employed as in the former experiments, the temperature being 60°, and the weight per gallon 8 ℔ 1 oz. During the process the temperature increased as formerly; and at the end of three hours, when the operation was finished, it was ascertained to have risen to 68°. The quantity of butter obtained was 27 ℔ of a quality much the same as that procured in the third experiment, but decidedly inferior to that of the first and second processes. A gallon of the churned milk weighed 8 ℔ 8 oz.

Fifth Experiment.

9th September 1823.—The same quantity of cream was used, at the temperature of 66°, and the weight per gallon 8 ℔. The churning occupied two hours and a half; at the end of which space the temperature was found to have risen to 75°, being an increase of 9°. 25 ℔ 8 oz. of butter were obtained by this experiment, of a quality sensibly inferior to that produced in any of the former experiments—being of an inferior appearance, a soft and spongy consistence, and not so pleasant to the taste. The weight of a gallon of the churned milk was 8 ℔ 7 oz.

The following table exhibits the mean temperature of the cream used in each experiment—the time occupied in the different churnings—the quantity of butter obtained from one gallon of cream in each experiment—the gravity of one gallon of the churned milk produced in each process—and the comparative qualities of the different specimens of butter:—

No.	Date of experiments.	No. of Gallons.	Mean Temperature.	Time occupied in churning.		Quantity of Butter obtained.			Quantity of he churned milk.	
				H.	M.	℔	oz.	dwts.	℔	oz.
1	1823, Aug. 18.	15	55°	4	0	1	15	7.5	8	9
2	...... 26.	15	60°	3	15	1	15	3.2	8	8
3	...... 30.	15	62°	3	0	1	14	0	8	8
4	Sept. 4.	15	64°	3	1	1	12	12 7	8	8
5	...... 9.	15	70°	2	30	1	10	10.6	8	7

OBSERVATIONS.

The butter produced in the first experiment was of the very best quality, being rich, firm, and well tasted.

The second experiment yielded a butter of a good quality, and not perceptibly inferior to the former.

In the third experiment a butter of a good quality was obtained, but of an inferior consistency.

The fourth experiment produced a soft and spongy butter.

The butter produced in the fifth experiment was decidedly inferior in every respect to any of the former specimens.

From the preceding experiments it appears that cream should not be kept at a high temperature in the process of churning. In the first experiment, when the temperature was lowest, the quantity of butter obtained was in the greatest proportion to the quantity of cream used; and as the temperature was raised, the proportional quantity of butter diminished;—while, in the last experiment, when the mean temperature of the cream had been raised to 70°, not only was the quantity of butter diminished, but, in quality, it was found to be very inferior, both with regard to taste and appearance. That the lowest possible temperature should be sought in churning, appears likewise from another result of the preceding experiments—the specific gravity of the churned milk having been found to diminish as the temperature of the cream had been increased: thus shewing, that, at the lower temperatures, the butter, which is composed of the lighter parts of the cream, is more completely collected than at the higher temperatures, in which the churned milk is of greater specific gravity.

From these experiments, then, the subscribers conceive themselves warranted in concluding, that the most proper temperature at which to commence the operation of churning butter, is from 50° to 55°; and that at no time in the operation ought it to exceed 65°: while, on the contrary, if at any time the cream should be under 50° in temperature, the labour will be much increased, without any proportionate advantage being obtained; and a temperature of a higher rate than 65° will be injurious as well to the quality as the quantity of the butter.

JOHN BARCLAY.
ALEX. ALLAN.

EDINBURGH,
30th October 1824.

ESSAY II.—*By* MR JOHN BALLANTYNE, *Hanover Street, Edinburgh.*

THE degree of thermometrical temperature at which butter from cream can be obtained, ranges from 45° to 75° of the scale of Fahrenheit; and, from the annexed experiments, it appears that the greatest quantity of butter, from a given quantity of cream, is obtained at 60 degrees, and the best quality at 55 degrees, in the churn, just before butter comes; for, in the experiments made, it was found that the heat rose four degrees during the operation of churning, though the temperature of the milkhouse was the same. Repeated experiments, made at this degree of heat, gave butter of the finest colour and quality, the milk being completely separated from the butter, which, when washed and made up in rolls, kept for a fortnight, without acquiring either smell or taste. At 60 degrees, the quantity is greater, but the quality much inferior, being soft and spongy, and giving out a considerable quantity of milk, when salt was applied, which may account for the additional weight. Several experiments were made with heat, up to 75°, the result of which, as will appear by the table, completely accounts for the great quantity of inferior butter made in the country.

By taking high heats, on purpose to accelerate the churning, the milk not being taken from the butter, it cannot keep either sweet or salted When the heat exceeded 65 degrees, no washing could detach the milk from the butter, without the aid of salt: but when a quantity of salt was wrought well into it, and the mass allowed to stand for twenty-four hours, and then taken to a well of spring water, and repeatedly washed, the milk by this process was got out, and the butter resalted in good order.

According to *Experiment* No. 1. sixteen pounds and a-half of butter (sixteen ounces to the pound), were obtained from sixteen Scotch pints of cream, and, from several experiments at the same heat the result was the same; that is, more butter was produced from the same quantity of cream than at any other heat, though the quality was inferior, both as to colour and texture, to the butter produced from heat, as in *Exp.* No. 2, which was of the very best quality, firm, well-coloured, and free from milk. At this heat, or as near it as possible, all the churnings through the season, except those made for experiment, were taken, and the butter was always of the very best quality, and the quantity the same as in No. 2, except towards the middle of September, when an increase of about six ounces was got from the sixteen pints of cream, in consequence of the milk producing richer cream than in the summer months.

Exp. No. 3.—The same heat was taken, but the experiment was made in a different form, and with milk from different cows, though the pasture was much the same. The churn was placed in the kitchen, exposed to a temperature of 60 degrees; but, by removing it to an out-house, the heat was brought down to 52°, at four o'clock in the morning, and, just as the butter was forming, the heat was found to be 56°, having risen four degrees. The quality was such as would insure a ready sale in any market, at one penny or twopence per pound above what I saw in the house made at a former churning. No. 3. in the table is an average of four experiments, made at the same heat, in all of which the butter was excellent.

Exp. No. 4. Heat of cream, when put into the churn, 65°,—rose to 67°,—in thirty minutes butter came, but it was what is called *bursting the kirn.* The quantity was deficient, and the quality really bad, being white, short, and bitter. Both salt and saltpetre were applied without effect, for the butter continued soft and pale. A few more experiments were made on a small scale, with heats as high as 75°; and, although butter was got, yet it was of such a quality as was only fit for grease butter.

Exp. No. 5. is the result of several churnings, taken at 50 degrees, in which the butter was of good quality, but evidently injured by being so long under the churning process.

From these experiments it appears, that the temperature at which butter from cream can be obtained, *in the greatest quantity*, is 60 degrees in the churn, just before the butter is formed, or 56 when put into the churn.

The *best quality* at a temperature of 51° in the cream, and 55° in the churn.

The temperature at which butter from cream can be obtained in the *greatest quantity and of the best quality*, is the medium of Exp. No. 1. and 2, or 53½° of cream, and 57½° in the churn before butter comes, as appears from No. 6. which gives the result of several churnings, taken at the medium heat of Nos. 1. and 2. At this heat every advantage is gained as to quality, and any additional quantity that may be obtained by higher heats, is only so much milk retained in the butter, which must greatly injure its quality. If the churning-house is properly constructed, it is easy to gain this heat through the whole season; for, when the heat of the air was 75 degrees through the day, it was only 50° in a thatched milk-house, at four o'clock in the morning; and when the heat is below that, with the assistance of hot water, you can bring it up to the heat wanted.

If the churning process is then carried on with heats, as in

Experiment No. 6, every advantage will be gained, as far as heat is concerned. Butter intended to be sent to the market sweet should be carefully gathered from the milk with the hand, and the milk gently squeezed out of it. It should then be put into cold spring water, and, after being well washed, it should be made up into rolls, with wooden flappers, and put into cold water to firm, but should not be allowed to remain longer than is necessary to firm it, as the water hurts both its flavour and colour. If intended for salting, the milk is well pressed out of it, and the salt well wrought into it, before it is pushed into the store kit.

No.	Date.	Scotch Pints of Cream.	Degree of Heat in the Cream.	Degree of Heat when Butter came.	Quantity of Butter, 16 oz. per lb.	Time of Churning.	Weight of Cream of 16 Ounces.	Heat of the Air at 8 P. M.
1.	1825. June 13.	16	56	60	16 lb. 8 oz	1½ hours.	4 lb. to Pint.	56°
2.	1825. June 20.	16	52	56	16 lb.	2 hours.	4 lb. to Pint.	52°
3.	1825. June 24.	16	52	56	16 lb.	2 hours.	4 lb. to Pint.	52°
4.	1825. July 12.	16	65	67	15 lb. 8 oz.	30 min.	3 lb. 14 oz. to Pt.	70°
5.	1825. Oct. 20.	16	50	53½	15 lb. 12 oz.	3 hours.	4 lb. 1 oz. to Pint.	50°
6.	1825. Aug. 20.	16	53½	57½	16 lb. 5 oz.	1¼ hours.	4 lb. to Pint.	

No. 1. shews the greatest quantity of butter produced by the above heats.

No 2. the best quality of the butter.

No. 3. The fine flavour and quality of this butter could not be surpassed.

No. 4. The quality soft, white, and milky.

No. 5. Quality injured by long churning.

No. 6. Answer to the Society's query. Quality most excellent, high in colour and flavour, and solid as wax.

ON THE MEADOWS AND DAIRIES OF HOLLAND.—*Communicated in a Letter from the Right Honourable Sir John Sinclair, Bart. to C. Gordon, Esq.*

DEAR SIR,

IN looking over some papers, I found a very curious account of a Dutch dairy, which I procured in Holland, in the year 1815. It was sent me by Mr Vandergoes, President of the Board of Agriculture in South Holland, whose dairy was reckoned the most productive and the best conducted in that country. I have just got it translated by Mr Espinasse, the French teacher here; and it seems to be very correctly done. I have no objection that the editor of our Transactions should take a copy of the translation, to be inserted in the next Number of that useful publication.

EDINBURGH,
10th October 1828.

Answers by M. VANDERGOES, President of the Board of Agriculture in South Holland, to the Questions of the Right Honourable Sir JOHN SINCLAIR, Baronet, regarding the Meadows and Dairies of Holland.

Sir JOHN SINCLAIR requests M. VANDERGOES to answer the following Questions.

1. What is the name of his estate, and its distance from the Hague?

Its name is Rustenburg, in the village of Loosdunen, three-fourths of a league from the Hague.

2. How many Dutch acres? Is there a great difference betwixt the Dutch and English acre?

There are 100 acres. The Dutch acre consists of 600 roods; each rood contains 144 square Rynlande feet. Two English acres are $\frac{1}{10}$th part short of the Dutch acre.

3. How many acres of meadows, and how many acres of plowed ground?

54 acres of meadow, and 45 acres in arable ground, kitchen gardens, and woods.

4. How many acres are cultivated for wheat, rye, oats, turnips, carrots, and potatoes?

From 12 to 15 acres in rye, oats, carrots, turnips, and potatoes in rotation.

5. What is the produce of each kind of culture?

The taxable produce of the cultivated ground for the first class, in order to determine the taxes, is fixed by the parish assessors at 30 francs per acre; the profit of each kind is determined according to the value of the produce.

6. What portion of the meadows is kept for pasturage, and what portion for hay?

About one-third for pasturage, two-thirds for hay. But this is regulated according to the quantity of hay which has been preserved from the last crop.

7. Which yields the greatest profit, hay or pasturage?

This depends upon the good or bad crop, and the quality of the hay, as well as the number of the cows and cattle to be fed.

8. What is the quantity of hay per acre?

It is in proportion to the quality of the piece of ground, and to the quantity of manure. The common calculation for good meadow-ground is 6000 pounds of hay per acre.

9. What is the price of hay at the Hague, and which kind of hay is most esteemed,—that of natural meadows or artificial ones?

The price of hay, in the environs of the Hague, varies according to the harvest. Good hay for horses is worth 16 francs, and sometimes even 40 francs, per 1600 pounds of hay. Artificial meadows are not in great use.

10. How many cows have you?

The number of my cows, when I had the honour of seeing you, amounted to 64, old and young.

11. How is their milk disposed of? Is it sold as milk, and made into butter and cheese, or used to feed the calves?

The produce of the milk of my cows is sold wholesale; it is taken by the purchaser to town in brass-pails immediately after milking, and it is distributed by him through the Hague.

12. Which is the most lucrative plan?

For a farmer residing near a town, the most profitable plan is to dispose of it wholesale; for others, to make good butter and cheese of it.

13. What is the quantity of milk given by a cow per day, week, month, or year, on an average of 20 cows?

40 good Dutch cows, well fed, and taken care of, may produce from 200 to 250 pints of milk every day during the year. According to the calculation of South Holland, a good cow is able to produce 76 pounds of butter, and 182 pounds of cheese, made with the skimmed milk, during the summer months.

14. How do you feed your cows during summer and winter?

In summer they are kept day and night in the meadows; in winter they are fed upon hay, turnips, carrots, linseed cakes, grain from the brewery, the haulm of beans, and boiled potatoes.

15. At what age are bulls sold, or put aside?

At the age of two years and a half I get rid of my bull, to give place to its successor.

16. When the cows are in the stable, is it useful to tie up their tails with a rope, and why should they be so?

Cleanliness requires this; otherwise they would shake their tails in their dung, and round the necks of the milkers; and, on the other hand, the cows suffer nothing from it.

17. Is it useful to keep meadows under water during the winter?

When the meadows are inundated by a shower, they are improved by the mud which remains. Rain or spring water is not useful, but often hurtful, when it remains till the spring.

18. What kind of manure is used in your meadows? What quantity? and in what season? What is the expence per acre?

The manure of horses is used in the spring, to protect the meadow-pasture from the frost and north wind. After the hay-harvest they use the manure of cows, &c.

19. How is butter made? With milk, or cream alone? Is it sometimes preserved with sugar, or saltpetre, is it well worked? How is the butter-milk disposed of?

Butter is made with cream alone. With the skim-milk they make a kind of cheese called Comyna Kaas. Butter is best preserved in casks or tubs, with a pickle made of salt, which is removed from time to time.

20. What taxes are laid upon the land, cattle, horses, and servants, of a landed proprietor or farmer? Is there any tax laid on day-labourers?

The imposable rent being determined by the land-tax, is calculated between 30 and 40 per cent. The tax for horses is calculated upon the fourth of the presumed yearly income, or rent. As for cattle, they pay some sous per head, according to their age, for the encouragement of agriculture. Day-labourers are free from taxes, provided they are neither fed nor lodged by the proprietor.

P. S. VANDERGOES,
President and Member of the Board of Agriculture, for South Holland.

THE HAGUE,
9th March 1815.

ON A MACHINE FOR RAISING STONES. *With a Description by* DAVID LOW, *Esq. of Laws.*

THIS machine was invented by Mr Richardson of Keswick, who received a reward from the Society of Arts for the invention. It was introduced into use in Scotland soon afterwards, by one of our most spirited and judicious improvers, Mr Spottiswoode of Spottiswoode ; and it has since been employed by a few gentlemen in different parts of Scotland. It is, however, far less generally known than it deserves to be amongst the practical agriculturists of the country ; for which reason a model of it has been placed in the Society's Model Room. I attempted, several years ago, an explanation of the principle of action of this machine, and for that purpose gave an account of it in the Edinburgh Philosophical Journal, nearly in the following terms :

Description of a Machine for Raising Stones.

The curious machine to be now described, has been employed, in some places, for the purpose of clearing uncultivated ground of such large masses of granite and other stones, comprehended under the popular name of whinstone, as could not be moved but by the aid of gunpowder. It is, I believe, very little known ; and yet, as a useful instrument, it well deserves attention. As it affords, besides, the means of making a very singular philosophical experiment, I trust that a page or two of the Edinburgh Philosophical Journal may be well employed in disseminating a knowledge of its properties and construction. With this view, I shall endeavour to describe a convenient form, in which it can be made for practical uses, and the purposes of experiment.

In fig. 1. A, B and C represent three strong wooden posts, about 14 feet in length, through the ends of which are three holes *a b c*, for the reception of the strong iron pin, D E, upon which is made to slide the curved iron-bar C G. The pin is so thrust through the holes in the posts already mentioned, that the post C of fig. 1. shall be next to the thick end of the pin E; the post B in the middle at *b*, within the bend of the crooked bar C G, and the post A, next to the pin at D, which is thrust through the other, to keep the apparatus together. The holes *a b c* being of such a size as to allow a little play to the posts, these last may be stretched out like the legs of the common theodolite, in the manner represented in fig. 1. To the curved iron-bar are then attached the fixed block M, containing four or more pulleys, and the moveable block N, containing the like number of pulleys. Each of these blocks must be hooped with a very strong bar of iron, and the pulleys must be of a size to admit of a thick rope passing over them. To the lower block N is to be hooked the iron plug P, consisting of a ring, a flat part, and a cylinder. The cylindrical part may be seven-eighths of an inch in diameter at the point, gradually increasing to about a sixteenth part of an inch more in diameter at the neck, and being about two inches in length. The end of the rope O, in fig. 1. passing over the fixed pulleys, is attached to the windlass F H, which may be six feet or more in length, and which is fixed by its axis to the posts A and C. At each end of this windlass in a winch T and U, for the purpose of saving time, by tightening the ropes previous to the windlass being worked. The windlass is worked in the usual manner, by levers, for the reception of which are mortises, as shown in the figure. At one end of the windlass is fixed the ratchet wheel V Y, (the catch X being fixed to the post A), for the purpose of preventing the weight from falling back when the moving power is withdrawn. The two posts A and C should be connected by a cross-bar, to keep them steady in their place.

The machine thus described is easily managed. It is placed over the stone to be raised, by extending the posts on each side, and then the windlass is attached. Of the stone to be thus raised, however large it be, it is enough to see the smallest part appear above the surface of the ground. At this part, let a workman, with a mallet, and the common steel-boring chisel of masons, make a small circular hole, about two inches deep, and as perpendicular as possible. This chisel should be of such a size as to make the hole about a sixteenth part of an inch less in diameter than the plug itself, so that a stroke or two of a hammer may be necessary to drive the iron home. When the latter is thus driven an inch, more or less, into the stone, it is attached to the block, and the ropes are tightened by turning the winch. Nothing more is now requisite than to set as many persons as may be required to work the windlass; and, strange as it will seem, with no other fastening than this simple plug, the heaviest mass will be torn up through every opposing obstacle.

I could well pardon incredulity in any one who was, for the first time, told of such an effect produced by such means. When the fact was mentioned to some distinguished men of science in this country, they remained incredulous, and were only convinced by seeing the engine itself at work; and I have not heard that any of these gentlemen have explained the principle of action of the machine. I understand that the general opinion, on first witnessing the experiment, was, that the iron-plug when driven into the stone, was not precisely in the direction of the moving power, and that the mass was raised and suspended in the manner shewn by the plugs A and B in Fig. 2. This explanation, I apprehend, cannot be admitted; and it is to the elasticity of the stone, and not to the direction of the moving force, that we must attribute the effect produced. The iron is forced down by a stroke, and retained in its position by the elastic power of the stone, in the same manner as a similar pin would be held by a block of wood, into which it was forced by the same means; with this difference, that the elastic power exerted upon the iron by the harder stones, would be incomparably greater than that exerted by the wood. That this is the true explanation of the phenomenon, is confirmed by the facts of the experiment itself; for, 1*st*, It is found that the moving power may be made to act in the direction of the hole with the utmost precision, without varying in the least the result; 2*d*, That, when the mass is raised from the earth, it may be moved into any position without being detached; and, 3*d*, That, while hardly any constant force will pull out the plug, a smart stroke or two of a hammer will do so with ease. Doubtless the force with which the iron is retained will diminish with the elasticity of the stone; so that it will be vastly less in the softer stones, as in freestone, than in granite, whinstone, marble, and the like. Indeed, I believe it is only in the latter species of stones that the experiment can be made with effect.

A person might conceive how a large mass of stone might be held suspended, in certain cases, in the manner before adverted to; but we cannot account for masses being raised in this manner from every variety of horizontal and inclined position; nor conceive how, if this were the mode in which the two bodies were kept attached, it should happen that, while no constant force that can be exerted, in whatever direction, will loosen the little piece of iron, the force of percussion will do so at once. Let any one procure a plug of the form described, and attach it in the manner mentioned to a mass of stone, and, instead of using machinery, let him pull the rope with the hand in any direction, and he will as soon move a tower from its base as the little plug from its position; so certainly is it the grasping of the stone, and not the direction in which the rope is pulled, that keeps the mass attached. In making the experiment with the machine, it is even necessary to be careful that the hole shall be made as perpendicular as possible; for, if made in the direction represented by the plugs A or B, in Fig. 2, that part of the stone is apt to give way which lies between the iron and the surface. We shall often be surprised, in trying the experiment on large pieces of rock, to observe with how slight a seeming hold of the stone the masses will be torn up. Sometimes the iron-pin is not driven above the fourth part of an inch into the stone before it becomes immoveable, and capable of raising a weight of many tons from the earth.

When we consider the greatness of the elastic power of the harder stones, as shewn by the simple experiment in question, we may perhaps wonder that the ingenuity of man has not hitherto more applied so surprising a property to practical uses. It appears, that, with a little piece of iron driven into a stone, with a force which a child might exert, the largest vessels might be moored; that, by the same means, masses of granite might be nailed, as it were, together, with a force which could hardly be overcome, and rocks suspended, as by a touch, in the air.

DESCRIPTION AND PLATE OF AN IMPROVED FIELD-GATE.

By James Hunter, *Esq. of Thurston.*

Having observed that field-gates are often made so heavy as to destroy themselves by their own weight, and that perhaps one-half of the materials employed has no other effect than that of adding to the weight, but not to the strength; and having seen other defects in their construction, I am induced to lay before the Highland Society a model * of what appears to me the most effective, and at the same time economical, form of the Common Wooden Field-Gate.

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* See Plate IV. fig. 3.

Description.	*Advantage.*
With the exception of a small spar for lambs, all parts of the above gate taper regularly from four inches to three inches in breadth, and from one and a fourth to three-fourths in thickness, (but any other proportions may be adopted.)	This makes the gate as light as possible, without diminishing its strength; and, by bending, it will save the risk of breaking, like the Reed in the Fable.
It is not placed between the posts, but on the face of the hanging-post.	This causes it to fall flat back on the hedge, when open; so that a cart cannot strike it.
The hinges are not near any joinings of the wood.	This gate will not rot at the hinges.
Each part of the under hinge is one and a half inch longer than the upper; and the upper shortens by means of a screw and nut.	It will either open or shut of itself, except when three-quarters open; and, if the point should droop, the upper hinge will take it up; and it prevents the joining at A from opening.
The gate is divided into four parts, of which the diagonal embraces two.	The gate being ten feet by four, this is probably the best angle for a diagonal; and it hardly requires a nail to keep it in its place.

There are other advantages, but the above are the principal ones; and I shall be most ready and happy to give any farther explanation that may be wished.

THURSTON, }
20*th* *Nov.* 1828. }

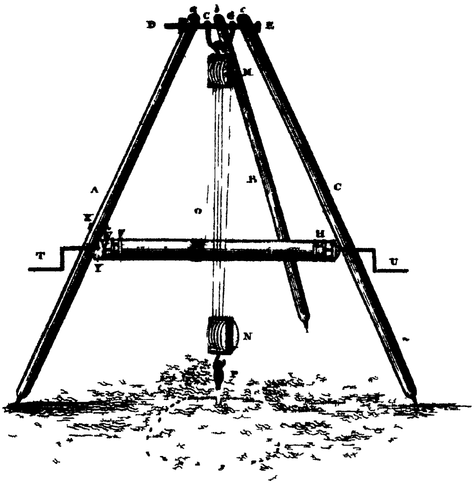
DESCRIPTION OF A FARM AND FAMILY STEELYARD, INVENTED BY MR JOHN RUTHVEN, EDINBURGH.

Extract from Report of Committee on Machinery, 1st January 1827.

A PREMIUM was voted to "Mr John Ruthven, for a steelyard, and scale adapted for weighing and readily discharging bulky commodities, chiefly designed for the use of farmers. The steelyard consists of a longer and shorter beam, with a moveable weight, to be shifted along the former, and a scale suspended to the latter. The longer arm, from its extremity being confined within a limited range, obviates the inconvenience of jerks and long vibrations, while an index upon it points out the required weight, by a counterpoise being slid backwards and forwards, till the point has been found, when it acts as an equivalent. By turning a keeper fixed to the scale, one end of it is opened, turning on a cylindrical hinge at the top, and the contents speedily discharged."

These balances may be made of any size required, either to suit the purposes of the farm, or the household. Their simplicity secures them equally against expense of manufacture, and the risk of going wrong, when in use. One weight only is required, the value of which, as a counterpoise, depends on its distance from the centre of motion, and it is so confined upon the long arm, that, though it has a perfectly free motion over all its length, it cannot escape at either extremity, and consequently can never be lost, which is a great recommendation to the instrument. The simple manner in which one of the ends of the tin-plate-scale opens up, round a wire hinge, is also very ingenious, and no less calculated to render the steelyard useful when weighing flour, grains, seeds, and such commodities.—EDIT.

PLATE IV



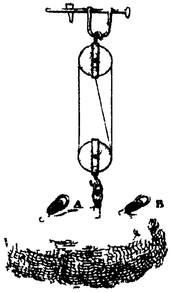


Fig 3

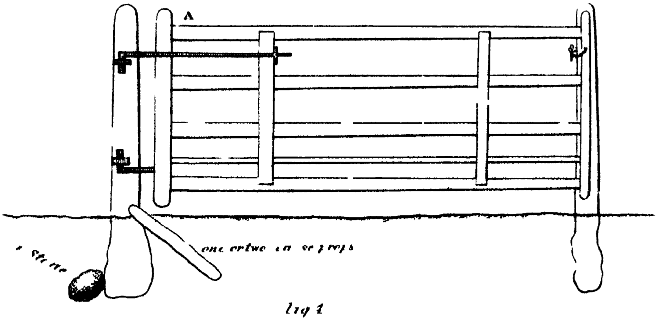
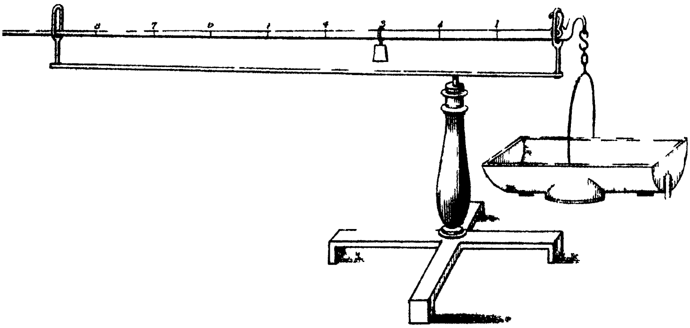


Fig 4



ESSAYS AND REPORTS ON DRAINING.

[The Society, aware that extensive operations in draining had been executed in many parts of Scotland, within a period comparatively recent, and that in a greatly more perfect manner than had been formerly practised, offered premiums for accounts of the drainage of any farm or considerable tract of land, executed within the last fifteen years. Of the reports received, one is here given at length; and a short communication by an eminent agriculturist, which, although it does not enter into those more minute details which it would have been desirable to obtain, has been deemed by the Society worthy of notice as recording an example of honourable enterprise. But notwithstanding of these reports detailing a system of under-drainage, conducted on the great scale, and on scientific principles, and of some other communications received, the object of the Society has not yet been fully accomplished, of inducing gentlemen generally throughout the country, who have been engaged in similar operations, to communicate the results of their experience. Although, therefore, the advertisement of premiums has been withdrawn for the present, the Society will be gratified by receiving any further reports and communications which agriculturists may be enabled to make on this highly important, but too little understood, department of rural labour.]

1. ACCOUNT OF THE DRAINAGE EXECUTED ON THE ESTATE OF SPOTTISWOODE, IN THE COUNTY OF BERWICK; DRAWN UP IN TERMS OF THE CONDITIONS PROPOSED BY THE HIGHLAND SOCIETY, FOR AN ESSAY AND REPORT ON EXPERIMENTS ON DRAINING. *By Mr James Black, Spottiswoode.*

In describing the drainage executed on the property referred to, the writer of these remarks will, in compliance with the directions contained in the printed particulars relating to the proposed Essay, give an account of the dimensions of the drains executed, of the kind and quantity of materials employed, of the expenses of the work, and of the other more essential particulars relating to its execution. He will further endeavour to communicate to the Society his views of the principles of under-draining in general, founded chiefly on the result of the experience acquired during the progress of these works.

The drainage to be now described has been all executed since the year 1815. The tract of lands upon which the operation was performed was mostly in a state of old grass, subject, however, to occasional intervals of tillage, for the purpose of keeping down or destroying the mosses, rushes and other aquatic plants, which were apt to infest the surface. Repeated endeavours had been made, at a great expense of money and materials, to render these lands dry; but the attempts had either failed entirely, or been but partially successful; and, at the time when the draining was attempted on more correct principles, there was not a field which could be said to be free from wetness. The hollows, consisting of marshes and peat-mosses, lay in their original condition, unfit for the operations of tillage; while even the better lands were intersected with springs in every direction, and the surface, accordingly, either covered with the coarser and inferior grasses, or with rushes and other plants of no value.

The lands had been originally drained according to the practice then prevailing, and still too prevalent, in every part of Scotland. The drains consisted of shallow trenches, of from two to three feet in depth, filled to near the surface with loose stones, thrown in promiscuously. They were formed with a view to catch and carry off the springs appearing upon the surface, but without attention to those circumstances in the inferior strata, upon which the main success of all under-drainage must depend. Independently, then, of failing to intercept the lower channels of water, the shallowness of these drains rendered them constantly subject to be choked up by the water on the surface; in which case they became injurious rather than beneficial, interrupting the flow of water which had been conveyed to them, and forming swamps and bursts where they would not otherwise have existed.

Mr Elkington, in England, had long ago developed the principles, and explained the practice, of under-draining; and his system was made known by the work of Mr Johnstone to the agriculturists of Scotland, but without being adopted on any scale which merits particular notice. The late Mr Stephens, who had come to Scotland, chiefly with a view to the laying out of irrigated meadows, had turned his attention, in a still more particular manner, to the laying out of drains, so little before understood in this part of the kingdom. The good effect of his system and practice had been experienced by many landed proprietors in different parts of the country; and, at the time when the proprietor of Spottiswoode thought fit to consult him, he had nearly completed a very extensive drainage on a neighbouring estate. The success of the operations on this property, and on some others, and the perfectly simple and satisfactory explanations given by Mr Stephens himself of his principles and practice, induced Mr Spottiswoode, the proprietor, at once to resolve to act under his guidance, and to recommence his own operations of draining on a new system, and an extensive scale.

This employment of an experienced draining engineer, previously to beginning, and during the progress of, extensive works of this kind, is a circumstance deserving of attention. By this means, many errors, inseparable from first trials, are avoided; and a great expence, as has been experienced in the present case, saved in the prosecution of the practical details. The advantages of being guided in some degree by the judgment and experience of a person who is in the constant habit of laying out drains, and who has thus the opportunity of observing their operation and effect in every variety of situation and soil, are many and considerable; and every one should avoid the self-conceit of expecting that his own limited skill and experience gained on one spot, will be equally availing as a knowledge and experience so much more diversified and extended.

The drains laid out, or executed, under the system referred to, were begun in the year 1815, and have been in progress till the present time; and a great extent of others, on the same principle, are laid out for future execution. From 500 to 600 acres of land have been thus improved, the lines of drains intersecting it amounting in all to about 5428 roods, equal to 32,568 yards, or about 18½ miles. Some parts of the drains required to be thirteen feet deep, but the medium depth may be stated at from five to seven feet. In order, however, to exhibit clearly the extent and dimensions of the several drains, a series of maps is herewith produced, in which they have been delineated in a manner, and for a purpose, which shall be more particularly adverted to in the sequel. But, besides the drains executed upon the lands in the possession of the proprietor, a considerable extent of drains, upon a similar principle, and of the like dimensions, has been executed upon the different farms of the estate. The usual practice has been for the landlord to defray the whole expenses of cutting these drains, and generally of quarrying the stones where that has been necessary, the tenants being always bound to lead forward the materials. This mode of extending and encouraging a proper system of draining had its obstacles at first, arising from the natural dislike to what was new and untried; but every one of the tenants who had been induced to allow the experiment to be made upon his farm, was ready, ere long, to acknowledge its superior efficacy over the less perfect methods before in use. Independently also of those covered drains, it has been necessary, in various cases, where the run of water in hollows has been very great, or in mosses which would not admit of being covered, to form open drains of considerable magnitude. These have served as outlets to the under drains, and as fences to the adjacent fields. The quantity of them has been very great, extending to several miles. They have been generally formed from twelve to twenty feet wide, and from four to seven feet deep. There is one of these on which some particular remarks shall afterwards be made, which was executed in conjunction with adjoining proprietors for the common benefit of the tract through which it was to run. It extended to between 400 and 500 roods, and has been found in the highest degree beneficial as an outlet to the drains around, and as removing a stagnant flood of water, which covered many acres during a great part of the year, and even affected the climate of the neighbourhood.

In all draining there is an evil to be removed. That we may form a distinct idea of the means of remedy, we must possess a certain knowledge of the nature and cause of the injury.

The general and more immediate origin of that wetness of land, which it is the object of under-draining to remove, will be found to be the existence of water in substrata of sand, gravel, open rock, or other porous substances, which either lead to the surface, or, having no natural outlet, become filled or saturated, while the pressure of more water coming from a higher source, forces that which is in the lower part of the stratum upwards through the superior strata to the surface; thus occasioning either bursts and springs, or a general oozing through the soil. The object in under-draining, therefore, is not to catch the surface-water, but that which flows through these inferior strata; and, for this purpose, it is necessary to make a sufficient channel, either at the lower parts of the porous stratum, or in such part of it as may most conveniently carry off the water, so as the pressure referred to may be relieved, or the water intercepted before it reaches the surface. It must always be kept in mind, then, that under-draining and surface-draining are operations essentially distinct; and every care must be used in practice not to blend them in the execution. If surface-water be allowed to get into covered drains, the sand and mud which it will carry into these subterraneous channels will soon choke them up, and occasion bursts, creating, as was before observed, new swamps; while the expense of taking up and relaying the under-drains will be very great, and the execution imperfect, the sides being found never to stand a second time so well as when first formed.

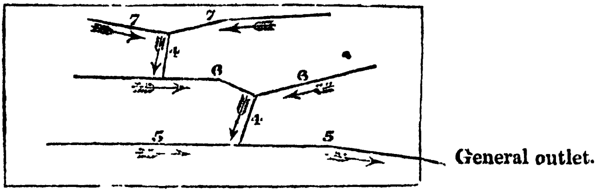
The grounds which were to be drained at Spottiswoode, consisted of a soil of various depth, under which commonly lay a stratum of clay from two to three feet deep, then a thin bed of sandy or gravelly substance, of a foot deep, or more, containing water; after that another bed of clay, of two or more feet deep; and, lastly, a bed of sand, gravel or slaty-rock, containing the larger quantity of water. Upon reaching the lower of these porous strata, the water disappeared in the upper one; and hence generally the expediency of not stopping at the first, but of working down till the main stratum was reached. Several instances occurred where the strata lay too deep to be reached by a drain; in which cases it was deemed necessary to sink wells or pits at certain distances along the line of the drain, from ten to eighteen feet deep, or more, in order to reach the open strata, so that the water, rising through the wells to the bottom of the drains, might be conveyed away without reaching the surface. It was never thought sufficient to have reached the first seam containing water, unless it were at the depth of four feet or more, and evidently appeared to be that containing the main body of water which occasioned the wetness of the surface.

The first operation in the process of draining, was to ascertain the depth and nature of the strata in which the water was contained, and the overflowing of which, where no outlet existed, produced, as was before remarked, either springs or bursts of water, or a general oozing. Along the line of these springs, or in the upper part of the wet ground, pits were sunk in various places. The place of each being marked out, a man was sent to dig each pit, breaking the ground nearly in the direction of the intended drain, six feet long and three feet wide, which is sufficient space to allow a man, or sometimes two, to work freely. The earth was then thrown to the lowest side, and well off from the pit, to prevent the sides from breaking in. These pits were made to the depth of five or six feet, or to a greater depth, if necessary, according to the nature of the ground, or until the bed of sand, gravel, or rock, which contained the water, was reached. Sometimes it became necessary, after having gone as deep as a man could work, and when no water appeared, to bore down with boring-rods, in order to ascertain at what depth the stratum containing the water lay. In some instances, where the surface was wet from a general oozing, and no regular spring appeared, it became necessary to go down to the depth of thirteen feet, when, on breaking through a thin cake of freestone, not above an inch in thickness, the water burst up, and filled the pit to the brim in the following morning. This species of examination prevents the working at random in laying out the lines of drains; affords data for judging of the depth and dimensions to which they should be formed; and, by giving a knowledge of the substances to be dug through, enables one to enter into contracts with the workmen with greater certainty.

Experience will soon evince to the drainer the necessity of thus making himself acquainted with the nature of the subsoils previous to commencing the operations of digging. One of many examples of the uses of this preparatory survey shall here be given. On a line of rising water, at the top of a boggy piece of ground, several pits were directed to be made by Mr Stephens; and, while they were being made, he went to some distance to direct some other operation. On coming back, in about the space of an hour afterwards, it was found, that, instead of having got down six feet at the least, as was expected, each man, after getting down about two feet, had come upon a narrow perpendicular edge of a whin-rock, and the water was rising on the sides of it, and filling the trenches. It was known that there was, for miles through the country, in the very direction, and near the line of this intended drain, a vertical whinstone dike, or narrow rock on edge, generally a little under the surface, but here and there rising above it. As it was impossible to sink the pits in the places first intended, new pits were directed to be made, about two yards below the original ones. These were sunk to the depth of six feet, and no seams containing water were found, but only stiff clay. A third set of pits were then made, about two yards above the original ones. In these a stratum of watery-gravel was soon found; and it was discovered, that the whin-dike which intersected the country, and which was not here above two or three yards in breadth, acted as a dam to this gravelly bed; and, preventing the water from flowing under ground any further down the bank, made it continually overflow; and this water running over the top of the whin-dike (the edge of which was but a little below the surface), formed the swamp below. Had these trial-pits not been first made, an attempt would have been made in vain, in the first place, at a great expence, to form a drain on the edge of the whin-dike. Next, a drain would have been made below the whin-dike, which would have been totally useless, as it is evident that it would not have carried off the water as a covered drain. The water would have continued to flow over the top of the dike, and to wet the ground below as well as above it, and the drain could not, without great expense and inconvenience, have been made an open one, as it must have been upon the line of a road then recently made, at a considerable expense, in the direction, and at the very edge, of the whin-dike; or else the road itself must have remained with a wet substratum for ever, between the whin-rock and the open drain. The third drain above the whin-rock must, therefore, have been made at last. This drain having been made just above the whin-dike, an opening was cut through the latter at a convenient place, and the water carried completely off, thus securing the perfect drainage of the ground, not only below the whin-dike, but also above it.

When a general idea was thus obtained of the nature of the piece of ground to be drained, and a number of men had been employed in sinking pits in various parts of the intended lines, the next operation was to make these lines upon the ground.

In doing this, a hand-sketch of the field or piece of ground was used, marking each line of drain on it as it was marked on the field, placing arrows to mark the direction in which the water was to be made to run (which in flat ground is sometimes a nicety to settle), and marking with figures the number of feet deep which each particular drain was to be made, as thus,—



the drains being here severally supposed five, six, and seven feet deep, and the outlets from one line of springs to another only four feet, these last being merely conductors of water already drained out of the open strata.

On the ground, the lines may be marked in various ways. When the land is in grass, a plough may be made to follow the director, as he walks deliberately along his intended line, a man leading the horses by the head, if necessary, and walking between them. If it is inconvenient to use a plough, the lines may be marked by pins, or small pits, a spade's breadth square, made at convenient distances, by cutting out a turf clean by four cuts of a spade, and laying it upside down at the side of the hole, in the line of the drain.

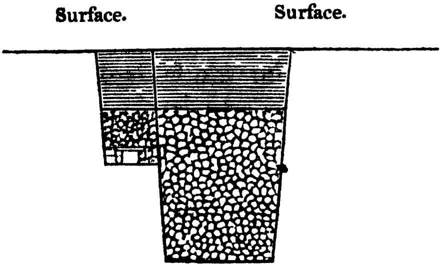
The lines being thus distinctly traced upon the ground, the drains were dug and formed along these lines in the manner to be now described, the upper edges of the drain coinciding with the line upon the ground. But, before entering more into the practical details of the operation, a genera idea shall be given of the structure of the drain, from written directions given by Mr Stephens himself, in the case of two particular fields, the lines of which had been previously delineated in the hand-sketch, and laid out on the grounds, in the manner just described.

" The drains lined off in the field No. 1., are to be cut three feet wide at the top, six feet deep, and two feet wide at bottom. The side-walls must be well built with dry stone, all laid on the proper bed (and not set up edgeways), nine inches thick by six inches high, forming an aperture of six inches square, the covers for which must be sufficiently strong to sustain the pressure of the incumbent weight of stone and earth; and should project, at least, three inches over the inside of each side-wall,—two feet of stone must be well packed above the cover of the aperture. The first foot of stone above the cover of the aperture may be put into the drains from three to four pounds weight, the upper part must be broken as small as common road-metal, and should be made quite smooth or level, so that every part of the drains may have an equal depth or thickness of stone. A thin covering of straw should be laid on the top of the broken stones, to prevent the loose earth from falling through to the aperture of the drains. The drains may be then filled with earth, nine inches above the natural level of the surface of the ground. Wells must be sunk along the lowest side of the lines of drains, in every place where the above mentioned depth of six feet does not reach the porous bed that contains water. These wells may be made from five to six feet square, or sufficiently wide to allow a person to work with freedom; and must be sunk through the impervious strata into the previous stratum of sand, gravel or rock, where the water flows freely. The wells may then be filled with small clean stones, thrown in promiscuously, till the stones in the wells come in contact with the stones in the drains. The upper part of the wells above the level of the stones in the drains may be filled with earth.

" The drains lined off in the field No. 2, are to be cut three and a half feet wide at top, seven feet deep, and two feet wide at the bottom. In all other respects, they are to be finished in the same manner as the above mentioned drains.

" The different outlets of the drains must be made sufficiently deep to receive the water, and built and filled in the same manner.

" Below is a rough section of a drain and well:—



If there is not more than one chain of impervious metal, there is no need of a well.

Certain deviations have occasionally been made from these directions, as shall be mentioned afterwards; and it is due to the ingenious and intelligent engineer employed, to state, that whenever any useful suggestion was made, however different at first from his own plans, he was always ready to examine its merits, and to approve and adopt it, if it seemed beneficial.

The stones of which the conduit at the bottom of the drain is to be built, and with which the drain is afterwards to be filled to the depth of two feet or more, as is shewn above, should be laid down on the upper side of the line, as near to it as possible, that they may be the more easily handed in. They are laid on the upper side, for the convenience of throwing out the earth on the lower side. It is very desirable that the stones should be, if possible, laid down before the drain is begun to be dug, as it is often necessary to build and fill it as fast as it is dug, to prevent the sides from falling in, which, when it occurs, occasions a very great deal of extra work; and the drains themselves are never so well constructed. This most frequently happens in ground under tillage, the sides being more tender than when in grass, where the turf is the means of preserving the sides from the pressure of the earth thrown out, and of the stones laid down. When the sides are evidently likely to fall in before the drain can be built, they may be kept up for a time by a board laid flat to each side of the drain near the top, and cross sticks put in to keep the boards asunder. Circumstances frequently occur, which prevent the stones from being laid down beforehand, and they are then brought forward as the work of cutting the drain is going on. Under the eye of an intelligent and attentive director, this may be done without danger; but, even then, unforeseen occurrences sometimes prevent the possibility of getting the materials forward for several days; and if rainy weather intervene, and the drains are in a clayey soil, there is a certainty of slips and falls, occasioning much extra labour, and requiring, in consequence of the additional breadth of the drain, a much larger quantity of stones to fill the opening. Where a piece of drain seems likely to fall in, it should always, if possible, be built and filled before night, or the sides kept asunder by means of boards, as before mentioned.

It is very usual to contract for all the operations which are to follow, at once and together. But the impropriety of this practice was very soon discovered, and the separation of the different operations has been invariably followed since; and Mr Stephens was fully convinced of the propriety of this, and recommended it to his other employers. When every thing is done under one contract, it becomes the interest of the contractors, if they are at all inclined to be dishonest, (and indeed the temptation is great), to build and fill in the drains as fast as they cut them. After a drain is built, and in part filled, it is impossible to be sure that it has been made of the proper depth, or that the conduit has been securely built, or properly cleared of mud. Instances have occurred, in other places, of very expensive drains having been made in this way, and very soon afterwards being found perfectly useless. Some of the persons who made these, coming afterwards to work under the restraints to be just mentioned, and finding it impossible to cheat in the depth and construction of the drains, went away, and left their contract unfinished; and chose rather to lose what they had worked for than fulfil it.

The drains may be cut only two feet wide, with the sides perfectly perpendicular, provided that, from the tenacity or hardness of the substances dug through, the sides will stand till the stones are put in. It is usual, however, to break the ground somewhat wider at the top, and so to give it a slight slope to the bottom. The work of cutting is always done by contract at so much per rood or yard, and several labourers generally join in making one drain, and arrange the work among themselves. The casting or cutting, it is scarcely necessary to observe, is always commenced by the workmen at the lower end, and worked upwards to the higher ground, and never downwards. They usually begin by working about two feet deep in the first instance, several roods in length, then going over the ground again, deepening it to four or five feet, and afterwards going over it the last time, and finishing the bottom, by making it perfectly level and ready for the mason to build the conduit in the bottom. The bottom must, for this purpose, be completely two feet wide, though, where freestone is employed, the width may be less. The building of the conduit is generally delayed till the stones are ready, if not laid down previously, and till an appointment be made with the mason, or other confidential person employed, to build the conduit, and the drainers are expected not to require this person's attendance (this being indeed a condition of bargain), until they have got as much ready as, with their own working before him in taking out the bottom of the drain, will give the builder of the conduit employment for half a day at least. The contract for digging the drain generally also includes the filling the earth into it, after the conduit is built, and the requisite quantity of stones put in.

The conduit is built in the bottom of the drain by a confidential person, either a mason, or any other workman who, by practice, is equally competent; this person always working at daily wages, to prevent him from having any interest in hurrying over this most important part of the operation. In order further to check any attempt at fraud on the part of the drainers, the practice, during all the operations on this estate, has been for the mason to begin his work as follows:—

He is informed previously what the depth of the drain is to be, and he takes with him a rod of a sufficient length to measure the dimensions. If he finds that the drain is not of the proper depth or width at the bottom, to an inch, he directs the contractors for cutting the drains to take it out to the proper depth, or make it of the proper width. If they positively decline to do so, he has strict orders to come away directly, and give information of their refusal. If he finds that the water does not run in the drain for want of proper declivity (for it is to be observed that this is a condition of the contract, so that the depth varies occasionally from the average depth denoted in the sketch, according to the rising or falling of the surface), he follows a similar course to get it made right. When the drain is of a proper depth and width at the bottom, he proceeds with the building of the conduit. Many attempts have been made to induce the masons to participate in a fraud, to cajole, coax, and even threaten them; but the answer has always been, that it was impossible, as a discovery (which, from the imperfection of the drain, or the constant superintendence, would soon take place), would cause the instant loss of their employment, and of their character, throughout the country.

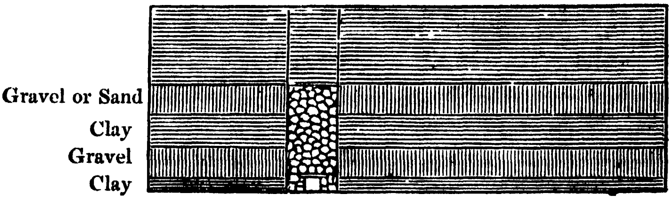
The mason has an assistant, generally a female, at the top, who hands him the stones he requires. He begins with small flat stones to build the wall on each side of the bottom of the drain, nine inches broad, and six inches high, so as to leave six inches for the conduit in the middle. This he does roughly, but in such a manner that the stones shall be laid solidly on one another. When the ground at the bottom is solid, either dry gravel, or clay, or rock, the mason's foot, with his ordinary clog, or shoe, standing in the centre, is the measure of the width of the conduit. When the land is inclined to be wet and soft, a plank six inches broad is used for him to stand upon. When the bottom is a wet spongy clay, or sand of the nature of a quicksand, or very soft, it is often necessary to flag the bottom of the conduit with very thin stones or slates.

A slate-quarry had been worked some years before on the property, and a good many slates had been got, but they were small, and of indifferent quality. These had lain for several years in the quarry, and were considered useless; but, in confirmation of the old saying, "Lay any thing by for seven years and you will find a use for it," these slates were found to be admirably adapted for flagging the bottom of the drains, and they were all used for that purpose; and many hundred roods of drains were made perfect, which must have been either ill made, or for which flags must have been procured at a considerable expense, and with a certain loss of time.

Sometimes when a perfect quagmire has been met with, which has happened chiefly in red-clay, the faster the wet clay has been thrown out, the faster it has boiled up from below. In these cases, it has been found necessary to lay planks on the bottom of the drain, and build upon them. But this will very seldom be necessary where proper precautions are used.

On first meeting with quagmires of this kind, attempts were made to dig them out; for which purpose a strong wooden frame was made, large enough for four men to work in with freedom, composed of different pieces, so that the workmen might add to the sides of the frame as they worked downwards. Notwithstanding of the frame being made very strong, the pressure became so great, that the sides came together and stopped the operation. The consequence was, that, after great labour, and active exertion, in taking out large quantities of the wet clay, which thus continued to boil up (but the very taking out of which undermined the banks from beneath), the sides of the drain fell in masses, and made great gaps, which increased the longer the work was carried on. In these circumstances, it became necessary to use planks to build the conduit, and to fill in the stones as fast as possible, by employing a great number of persons at once. The weight of these superincumbent stones then kept the planks and conduit at their proper place, so much so, that the worst of these parts never exhibited any symptom of imperfection, though made ten years ago. On all occasions afterwards, however, when any of these quagmires were found, the process of taking out the bottom of the drain was followed yard by yard, by flagging the bottom, building the conduit, covering it, and filling the stones over it; and, in this way, the quagmire was prevented, by the immediate pressure from above, from boiling up. It never failed to be seen, that the longer these operations were delayed, the softer and more intractable the interior of the drain became.

The mason, after building the side-walls for a yard or two in length, according to circumstances, cleans out the conduit with a narrow hoe, and then covers it with such large broad stones as he can procure, from fifteen inches in length to two feet, being the utmost width of the drain itself. These are handed down carefully to him by his attendant; and, after he has laid three or four of them, he takes smaller flat stones, as the larger are always uneven at the edges, and covers every interstice; and afterwards, with similar stones, packs carefully the ends of the covers, before finishing any particular portion of the work, so as to prevent them from shifting; and still farther to cover every hole through which any thing might be carried into the conduit, he has a rolled-up wisp of straw which he puts into the mouth of the conduit, which allows the water to pass out, but prevents mud and sand from getting in. His attendant then throws the remainder of the stones in promiscuously to the depth of two feet, or sometimes more, if the materials are plenty; and particularly where there are two seams containing water; for, in this case, it is generally desirable to raise the stones above the level of the bottom of the upper seam, so as to convey away any water which may remain in it, to the conduit beneath, as shewn in the diagram below; and it was a circumstance very generally observed in the course of operations, that, where the upper seam containing water was only a few feet in depth or thickness, another open stratum was generally found a few feet deeper.



When the stones to be used are only brought forward at the time of cutting the drain, the carts are often run back to the edge of it, and the stones, after the conduit is built, tumbled straight out of the cart into the drain; but, in this case, it is necessary to take care that the sides of the drain be not injured by the cart-wheels, or otherwise, lest the earth should fall into the drains, and so through the intervals of the stones. A part of the stones for filling were recommended by Mr Stephens to be broken like large road-metal. This, however, is very expensive, and was found by experience not to be necessary, though unusually large stones should be broken. When the stones are small, that is, ten or twelve ounces, it is as well; but no inconvenience has been found from the constant use of stones of a much larger and very unequal size. When a sufficient quantity of stones has been thrown in, the mason levels them at the top, filling up the intervals of the larger stones with smaller ones, so as to make the top of them level. If the sod which has been cut off the surface of the drain is sufficiently solid, it should be laid carefully by itself on the upper edge of the drain at the side of the stones. It should again be laid with its grassy side undermost, on the top of the stones, as a covering, to prevent the earth from getting down amongst them. If the sods are not sufficiently coherent or plenty to cover the whole completely, old coarse hay, or straw, or heath, may be used as a substitute. When all this is completely done, the earth is shovelled in upon the top, until the drain is full. It is then heaped up, somewhat after the manner of a grave, to allow for the earth's subsiding to the level of the surface. It is a circumstance deserving of notice, that, in digging the trial-pits, the earth taken out is, in most cases, insufficient to fill them again, if allowed to lie open for any time; so that, in fact, contrary to what would be naturally inferred, the earth must become more compact by being removed.

When the drain is thus completed, it is still necessary, and particularly when the land is under tillage, carefully to inspect it from time to time, and to see that no surface-water finds its way into it. If any hole is found, it ought to be immediately stopped up, as a channel of this kind will sometimes very speedily carry enough of mud into a conduit to choke it entirely, and spoil the drain. Under-draining, it will be kept in mind, will not supersede the necessity of surface drains, where these are necessary to carry off water stagnant upon the ground.

Besides the danger to drains from the flowing in of surface water, there are other sources of injury which must be guarded against by a vigilant care. Animals, by burrowing in the earth, or finding their way, from any cause, into the conduit, are sometimes apt to injure it, and cause the earth to crumble in; but a more frequent source of injury is from vegetable substances, as roots of trees, and particularly of the ash. As an instance of this, there happened, on this property, to be an ash-tree growing near a drain, the fibres of which took possession of the conduit, and so obstructed the passage of the water, as to produce a new swamp, in consequence of which, it became necessary to lift the materials of the drain, and form it anew. It is often very difficult to eradicate certain plants, whose long and creeping roots get intertwined in the interstices of the conduit. The advance of those larger animals which enter the conduits for safety, or in pursuit of prey, may be prevented by an iron grating at the outlet.

The effect of these under-drains will be more or less directly felt, according to the nature of the soil itself. When this is in any degree open, sandy, or gravelly, the effect of the drains, when properly executed, will be immediate and complete. When there is a considerable bed of clay above the stratum containing the water, it will often require two, or even three, seasons to dry this body of clay completely. It will be at once much drier than it before was, but the full effect of the drains may not be felt till the third season. Where it is convenient, the pasture may be broken up, and undergo a regular rotation of crops, and be properly laid down to grass again. Where the pasture is generally good, and it is desirable not to break it up, the rushes and coarse grass should be cut, the tops of the drain limed and harrowed, and sown with good grass seeds, and rolled, and the whole part, which was formerly wet, top-dressed, and fed very close, so as to destroy the coarse plants, and give room for the finer kinds to rise, which they will do readily when the soil is made dry; for the finer grasses often exist in a minute state amongst the coarser herbage, but shoot forth with vigour when the restraining cause is removed. This is seen in the case of some species of native white clover, which exist in a minute state among the plants of heath, or the seeds of which lie dormant in the ground. If lime be applied in sufficient quantity to destroy the plants of heath, the clover, to the growth of which the calcareous matter is favourable, will quickly spring up in an enlarged state.

As a part of the system of drainage pursued on this property, allusion was made to certain open drains which had been formed in hollows, where the run of water was too great, or where the nature of the earth prevented the formation of a covered drain. Of these only one need be here noticed; and even in regard to it, it would have been unnecessary to make any observation, were it not that the construction of these open cuts, simple as it may seem, is often so defective as to render the whole of a heavy expense in a great degree unavailing.

The most common defects in the construction of these works are,—the not forming the channel sufficiently capacious to contain the water in case of floods,—the not giving a sufficient slope to the sides,—and in the turning the course of the water at sharp angles. In all these cases, the effect is the injuring and bringing down of the banks, which are often seen scooped into large hollows, through which the water endeavours to force itself in a new channel.

The drain referred to, extended to 1860 yards in the main cut, and to 825 yards in the minor branches communicating with it. It extended through a level tract, through which a rivulet flowed, and kept the land adjacent in a state of constant swamp. The general depth of the main drain was from five to seven feet, and the width varied from fifteen to twenty-one feet, in such a way as that the width at the bottom was always four feet, and the inclination of the sides an angle of 45°. The minor branches were executed at an expence of 6s. a rood, and the large drain at 3½d. per cubic yard. This included the wheeling away of the earth, and filling with it the channel of the former rivulet; and where any excess of earth existed, the spreading it regularly upon the surface, so as that no water should stagnate on the adjacent grounds, but run, without interruption, into the drain itself. The ground passed through consisted partly of alluvial clay, in a few cases of sand, partly of moss, and partly of compact gravel, which required the use of the pick. The expence of casting and wheeling amounted to L. 280; but, with the cost of surveys, the under building of bridges, and other incidental charges, the total expence amounted to L. 351, which was divided between the properties interested in the ratio of the extent of the meadow-land belonging to each in immediate contact with the line of drain. In forming the cut, sharp angular turns were as much as possible avoided; the slope of the banks was never less than that above mentioned; and where the earth was so loose as to threaten to fall in, piles were driven into the sides of the banks in a direction perpendicular to the line of inclination.

In speaking of covered drains, it was before observed, that the effect of their action was felt more or less remotely, in proportion to the nature and tenacity of the soil which was acted upon. It is a gratifying part of these remarks, to be enabled to state, that the general result of the operations has been such as to bear out the calculations of the engineer, and to justify the most sanguine hopes that could have been formed of a valuable improvement. Bursts and springs, which formerly disfigured entire fields, and which rendered tillage precarious and unprofitable, are now not to be seen; and swamps, which were not only useless in themselves, but which injured all the lands around them, have been totally removed. The consequence is, that tillage can now in those parts be carried on without interruption, and with nothing beyond the ordinary expenditure of labour and manure; and a sward of the best grasses raised and continued on spots which formerly only produced the coarsest and least valued herbage.

Besides those effects of the improvement which were, in a certain degree, to be expected as a consequence of laying the lands dry, others have resulted, which, it must be confessed, were not at first so clearly contemplated. The hurtful effect of rime, or hoar-frost, on vegetation, is a circumstance familiar to all who have had experience of cold and elevated districts, or of lower lands subject to exhalations, or excluded from the influence of the sun, and currents of air. The frost-rime, in these swampy hollows, of which mention has been made, was found, even in the warmest seasons, to be productive of serious inconvenience and injury to the growing crops; and that chiefly at the period when the grain was approaching to its maturer state. This evil, it may be said, has been removed, or, at least, is now so little felt, that the grain produced in these very hollows has, for many years, escaped the smallest perceptible injury from this cause. Indeed, any one who will look along a moist and swampy surface, when the frost-rime prevails, will see the vast and beneficial effects to the climate around, of a removal of so obvious a source of injury. No one can mistake the proximate cause of the phenomenon itself, since the rime will be seen to hang over every swampy place, and to follow the turns of every rivulet and marshy tract.

Another effect which was still less contemplated, and has not less agreeably resulted, from the drainage undertaken, has been the improvement of the trees and woodlands on the property. Lines of drains were occasionally formed in the woods, as on the arable lands; but even where this was not done, a beneficial effect seemed to be produced by the adjoining drainage,—its powers evidently not being limited to the mere spot where it took place, but extending to a considerable distance. A very large extent of plantations had been formed upon this estate: sometimes considerable difficulty was experienced in nursing them up through the first stages of their growth, and often the individual trees grew up with stunted stems, and covered with those parasitical plants which indicate an unhealthy growth. Latterly, this evil has been infinitely less felt, owing, in a material degree certainly, to the superior management of the woods themselves, but obviously also in a certain degree to the greater dryness of the ground. The effect of the drains in the improvement of the plantations adjacent was obvious and immediate; and many friends of the proprietor's, on calling to look at the improvements in progress, have expressed their surprise, that the woods had been making so much more rapid a growth than they had ever formerly made. Since several of these woods have been laid dry by the under-drainage, the land, in many of the hollows, has sunk so much, that the roots of the trees have been left standing up bare above the surface, with the appearance of a crow's foot; and parts, which were formerly boggy and marshy, and in which sportsmen used to stick fast when hunting, are now perfectly solid, with a good sward of grass, over which any one may gallop with freedom.

Another of the effects which have resulted from this drainage, is not undeserving of attention. An example of correct draining has been set to the tenants upon the estate, who have seen the operation conducted under their own eyes, and who are no longer ignorant of its superiority over the methods before in practice. The advantages of this will be appreciated by those who know the timidity with which new trials are often made, and the reluctance with which ancient practices are laid aside.

An advantage also of a more partial and local nature, but not unimportant in itself, has resulted from the operation. The stony part of the ground has been relieved, not only of surface stones, but of those near the surface, which were earth-fast, and which were at last generally taken up, broken, and used when materials became scarcer. In this operation was employed the very singular machine for raising large stones, which was first introduced into Scotland upon this property *. This instrument was found extremely useful, simple in its application, and of a power which excited the surprise of all who witnessed it. The removal of these stones, besides relieving the eye of unsightly objects, has

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* A description of this machine has been given in the present volume, at p. 206, of the Society's Transactions.

increased the productive surface of the soil, and rendered the tilling and general cultivation of it greatly more expeditious, and less expensive: and, indeed, the quantity of stones consumed in the drains was often greater than was absolutely indispensable, from the mere desire of thus clearing the surface.

The tools employed in all the preceding operations have been merely those in ordinary use; namely, the spade, the shovel, the pick, and the like.

Soon after commencing the operations, it was deemed necessary to make and keep correct plans of the drains, from time to time, as they were completed, and before the superficial appearance of them should be lost. In a book are laid down, on separate pages, from the general survey of the property, the plan of each field that has been drained. When the drains are completed, they are accurately surveyed, and laid down on the plan in the book, with the distances of various points of them, from the fences marked, as taken down in the surveyor's field-book; so that at any time hereafter, by actual measurement, the precise situation of any drain may, when required, be found, although all appearance of it on the surface should have been long totally obliterated. In addition to this, the various depths and directions of the current of the drains are marked, and the prices per rood actually paid for cutting each. To this is added a calculation, as near as can be made, of the expense of transporting the materials, of the mason-work of the conduits, and any extra charges, showing together the actual cost of draining each field. A copy of this book is presented along with this essay, as an example of the manner in which the book itself is executed; as an answer to the queries made by the society, in regard to extent, dimensions, and cost of the drains; and, lastly, as conveying the surveyor's attestation of the extent of the drains executed. The utility of such a book is apparent. Amongst other uses, it forms a satisfactory record of the cost of the operations; and thus enables a person, with a knowledge of previous and subsequent rents or produce of the land, to form an idea of the advantages derived from draining, compared with the outlay.

The advantages of draining, and upon just principles, has been shown in the case of one property; but these advantages are capable, in this country, of a wide extension, and the principles laid down of a general application. In a climate so cold, so moist, and so variable as that of Scotland, the freeing the land from injurious moisture may be held to be one of the most essential improvements of tillage-land, and as the basis upon which all future amendment of wet soils must rest. When the surface of land is interrupted by springs, or saturated by the oozing of water from beneath, every operation of tillage is precarious, and the application of all manures, and of every means of improvement, less effectual to their end. No one, in short, but the practical agriculturist, who has had experience of the tillage of cold and weeping soils, can imagine all the evils and drawbacks experienced in cultivating them, nor the radical and instantaneous change produced by the removal of the cause of injury.

In proportion to the vast private, and, it may be added, public advantages of thus improving the surface of the country, it is to be regretted that the means of effecting the object are still so little known, or unskilfully used. The system of under-draining in general use in the greater part of Scotland, is in a remarkable degree imperfect. It is, for the most part, a confounding of the objects and practice of under and surface draining, and fails, accordingly, in effecting either purpose as it might. Lines of ill constructed drains are run almost at random, formed without regard to permanency, and, for the most part, of a depth insufficient to reach the water in its channels beneath. The most imperfectly constructed drains, indeed, will be of some avail, and may often, in the case of porous subsoils, remove entirely the causes of wetness; but, in the great majority of cases, wherever the proper means are not employed, the evil will remain untouched, or be but partially remedied; and it may be affirmed in general, that, in no species of improvement on land, has more money been unprofitably expended than in injudicious draining. Every part of Scotland furnishes the evidence of this; and it is impossible not to regret the misapplication of useful materials, in attempts which, if directed aright, would lead to a lasting and satisfactory improvement. Abundant as our stones in Scotland are, they are not always inexhaustible; and, in many considerable districts, the want of them in sufficient quantity, and available at a reasonable expense, for the purposes of agriculture, is felt as a serious evil. In the lower parts of some of the south-eastern counties, many farmers have been forced to take up the materials of their old and useless drains, and apply them anew in the construction of others. The stones of fences, of old buildings, of deserted roads, and the like, have been all eagerly seized on; from which, and similar examples, it may be imagined how important it is to economize resources so useful, and not to waste them on mistaken plans.

One objection has been urged against the adoption of the system of draining now recommended; namely, the greater expenses of executing the work. A general answer to this might be, that the practice which is ineffectual, can never be a cheap one. But even in the mere matter of cost, the balance will probably as often be found to turn in favour of the larger as of the smaller drains. If the first be larger in size, the latter must be more numerous; and a single good drain, well laid out, will be often seen to do that which a hundred minor drains would fail to effect. The chief difference of expense is in digging the drains; for in regard to the materials of filling, it is to be observed that the larger drains are not at all filled in the same proportion to their size as the lesser; which circumstance, combined with the comparative smallness of their number, will, in this particular, generally shew the balance of saving in expence to be on their side. The quantity of materials, indeed, which has been consumed in these smaller drains, in a few of the earliest improved tillage counties of Scotland, is surprising. Instances are constantly occurring where new drains are in the course of construction, of their lines intersecting innumerable smaller drains, long since forgotten and choked up, and serving no useful purpose as conductors of water.

Before concluding, the writer cannot but recur once more to the merits and useful services of the individual to whose intelligence and skill the successful result of the operations now detailed is due. These operations were carried on in perfect harmony with him from first to last. His own plans were always formed with judgment and caution, and his instructions given with precision; and whatever useful variations were made in them from time to time, were, with his characteristic good sense and modesty, duly appreciated, and adopted by himself.

Mr Stephens, indeed, not only possessed a perfect knowledge of the particular subject to which his attention was so constantly directed, but such an acquaintance with various other branches of rural economy, as made his counsel and assistance esteemed in the highest degree by those who consulted him; while his modesty and kindness of disposition were not less felt and valued by his friends, than his talents and general knowledge. When it is considered how much he effected, and in how short a time, how many prejudices he had to encounter, and how successfully he combated them, and how great the importance has been of laying, by means of a widely extended example, the foundations of a better system, in one of the primary departments of rural improvement, it is impossible not to feel, that the warmest tribute paid to his merits has been well earned, and he deserves to be ranked amongst the benefactors of Scottish agriculture.

ACCOUNT OF THE DRAINAGE OF A FARM IN BERWICKSHIRE. *By* *John Wilson, Esq. of Cumledge, in a Letter to the Secretary.*

Observing in the list of premiums offered by the Highland Society of Scotland in 1826, for improvements in agriculture, that a premium is offered for the best and approved account of drainage of any farms, &c. in Scotland, within the last fifteen years, I beg leave to state, that I do not intend to compete for this premium by writing an essay on draining, but merely to lay before the Society a few of the practical details relating to a drainage executed by me, and at my sole expense, on my farm of Preston in Berwickshire, the property of the Right Honourable Lord Douglas, within the last eleven years.

This farm consists of about one thousand acres of arable land, about three hundred of which are light hill ground, five hundred strong retentive clay or loam, upon an impervious substratum of clay from five to eight feet deep, and two hundred gravelly open bottomed soil, much broken with springs. The whole farm has a considerable declivity to the south. The hill grounds, and the gravelly soil, I found it an easy matter to drain; and had nearly made those parts of the farm dry with the old fashioned and imperfect three feet deep drains, during the currency of my former lease; but I had long considered the clay-land incapable of being drained. Having taken a new lease of my farm in 1814, I resolved, if possible, to make it dry; as, without its being so, most other improvements are of little avail. But I found so much difficulty in fixing upon the proper lines of drain, as the ground did not contain marked lines of springs, but had a general oozing of water over the whole surface, that I was induced to employ the late Mr Richard Stephens, well known as a professional and very scientific drainer. Mr Stephens laid out the drains in the most judicious and least expensive manner. His plan was, on going into a field, to make pits in the most likely places, which enabled him not only to determine the proper lines, but also to ascertain the depth of the strata that contained the water, which was generally in a bed of gravel, sand, or rotten rock, from five to eight feet below the surface, under a stratum of hard impervious clay. When the drains could not be made so deep as to reach the water-bed, pits were dug in the bottom of the drains down to it, which appeared to me to answer the purpose extremely well. Most of the drains were made six feet deep, two and a half feet wide at the top, and one foot four inches at the bottom, and filled up, first with a conduit of freestone, made with a stone set on edge on each side, and one over the top. When the bottom was quicksand, the conduit was paved with flat stones, and above the conduit, with small land stones, blinded with rotten rock or freestone broke very small, to prevent the earth getting down, and the earth was again put in with a spade or the plough. Before beginning to cut a drain, where there was much surface water running from the higher grounds, I made a trench about ten yards above it, to prevent the water getting in during the operation, and generally kept it open for a year or two, until the ground was completely consolidated upon the drain. This is a most necessary precaution, as drains are more frequently injured, and even altogether choked up, by surface water carrying down the mud into them, than by any other cause. It is also of the greatest consequence that the conduit be carefully and substantially made, as any thing going wrong there renders the best part of the drain ineffectual.

The expence of cutting the six feet deep drains was, per rood of six yards, . . .	L. 0	2	0
Making the conduit, ...	0	0	2
Carting, quarrying, and gathering five loads of stones, which cost (according to the distance) from 8d. to 1s. 4d., average 1s. per load,	0	5	0
Filling in the small stones and the earth, .	0	0	6
Average cost per rood	L. 0	7	8

Although Mr Stephens' plan of pitting is well adapted, in most cases, for finding out the proper lines of drains, yet, in the course of my drainage, I have met with some instances where it was not so satisfactory. In these cases, I drove lines of drain from the bottom to the top of the fields, as outlets, and, by thus intersecting the strata, and laying them more clearly open to view, was enabled to fix upon the proper places for the lateral lines. I have frequently found dikes of impervious clay running from side to side of a field, and, immediately on crossing them, got into beds of sand full of water.

With regard to making drains in quicksands, I have found it to be a very good plan, to cut all the outlets in the first place, and, when that is done, to begin at the higher part of the field with forming the cross drains, thus always diminishing the quantity of water below; and by taking out only half the depth of the drain at once, the sides become more firm, and not so liable to slide in; and, when taking out the other half, never to take more than two or three yards at a time, until the stones are close filled up to the workmen.

From 1815 to this date, I have completed twenty-four miles of drains, which have been surveyed and laid down upon a plan by Mr Blackadder, an eminent land-surveyor, which will be produced along with this letter. I have, besides, kept a book, in which each field drained is laid down, and the lines of all the drains within it accurately delineated, and also a table of the expence. There will also be produced a transcript of one of the leaves of this book, as an example of the manner in which the whole has been executed.

Since this drainage, the expence of cultivation upon the clay part of the farm has been very much diminished, and the quantity of produce, both in corn and grass, considerably augmented. Formerly this part of the farm was so very wet, that, although better adapted for wheat than any other crop, the season for sowing was frequently lost, and, after an expensive fallowing and liming, it was sown with oats in spring, of which it always produced very poor crops. It is now so dry as to grow very good crops of turnips or rape, which are always eaten upon the ground with sheep as early in the season as possible; and, except in two instances, I have always sown my wheat in capital order.

It might have been satisfactory to have entered into some of the more minute details relating to this drainage, but circumstances have prevented me from doing so at the present time, and I trust the general map of the drains will afford an answer to some of the most material subjects of the inquiries proposed by the Highland Society. In the mean time, I trust my communication will be received as the record of an instance of successful drainage, on a scale which is perhaps unusual in the case of a tenant, and on a lease of ordinary duration.

ON THE FLEMISH SCYTHE.

[Harvest work being at all times a subject of great interest in our variable climate, the Society consider the following extracts to be deserving of a place in the Transactions.]

" *Report of a Committee of the Highland Society of Scotland, in regard to the Experiments made in Scotland, in Harvest* 1825, *with the Flemish Scythe.*

" BEFORE entering upon details connected with the experiment made with the Flemish scythe, and in the hope of affording a more satisfactory view of the subject upon which it is their duty to report, your committee will briefly advert to the circumstances which led to the exhibition of this implement in Scotland last autumn, and to the course which the Highland Society of Scotland resolved to follow in promoting the experiment.

" It had been long well known, that an instrument for reaping, totally different from either our common scythe or sickle, and adopted in preference to them, was in general use throughout Flanders and other parts of the Continent, and several partial attempts had from time to time been made to introduce it into Great Britain :—These, however, were the insulated attempts of individuals. Meritorious and locally successful as they might sometimes be, still they necessarily failed in carrying along with them that general conviction of failure or success, which a trial under the auspices of your Society could hardly fail to command. A suggestion upon the subject having been submitted to the Directors, it was readily listened to, and an arrangement was finally concluded, to the satisfaction of all parties, with two respectable intelligent young farmers of Flanders, who agreed to visit Scotland for the purpose of exhibiting the Flemish scythe, and of instructing our labourers in its use.

" With these views, and under these circumstances, John B. Dupré and Louis Catteau, reached Edinburgh, and commenced their operations by an experiment upon the farm of Lochend, occupied by Mr Oliver, on the 15th of August last. Arrangements had been previously made with the agricultural societies of various districts, who were desirous of having a trial made, and who had most readily contributed towards defraying the expence. M. le Chevalier Masclet, Consul for France, who had already given his aid in the arrangements, consented to accompany the Flemings in their tour; and, being completely master of the English language, his services became most valuable in holding communication with those to whom it was necessary to explain the mode of using the scythe. Between the 15th August and the 13th of September, the Flemings exhibited the operation of their scythe in twelve distinct districts :—

1. East Lothian.
2. Berwickshire.
3. Roxburghshire.
4. Mid-Lothian.
5. Lanarkshire,—Upper Ward.
6. Renfrewshire.
7. Stirlingshire.
8. Fifeshire.
9. Perthshire,—Carse of Gowrie.
10. Forfarshire.
11. Aberdeenshire.
12. Morayshire.

and on one occasion at Inverness."

The Report proceeds to state in detail, the particular circumstances of each experiment, as specially certified to the Society by local committees appointed for each place of exhibition, which, it will be observed, include a very considerable and important portion of Scotland. It does not appear necessary to enter minutely into these details, which are very precise; but it may be stated that, upon the whole, they are perfectly favourable, and that no impediments at all important any where occurred.

" In most of the experiments, the ground is stated to have been free from stones. Where these abound on the surface, or other rugged substances are found, the Flemish scythe cannot be employed to advantage.

" The only points unfavourable to the introduction of this instrument, stated in the foregoing reports, are,—

" *1st*, The opinion of the East Lothian Company, that it is not adapted to cut down thin or light crops.

" *2d*, The idea expressed in the Fife report, that the labour seemed greater than that of the sickle, and that it was not an instrument adapted for the use of females: And,

" *3d*, The doubts regarding its efficiency in thin crops, expressed in the report from the county of Forfar.

" The first and last of these fall to be classed together, and a very sufficient answer to them seems to be found in the reports from Roxburghshire, Lanark, and Carse of Gowrie, where light crops were actually seen to be cut down, with nearly the same success as those of a more weighty description. The doubt expressed by the Fife Committee, regarding the fatigue, and which, indeed, is qualified by noticing the great heat of the day, may be also referred to what is stated upon this point in every other report; and, it may be added, that the two young men should not be viewed as ordinary labourers, but as two young farmers of the better class, among ourselves, more accustomed to direct than to perform such branches of husbandry. With regard to its fitness for female labourers, your Committee can only say that it is in general use among the women and girls in Flanders, and that no reason appears why it should not be similarly employed in Scotland.

"Your Committee have now submitted the result of the reports made to the Society from the different districts; and which, it will be seen, fully bears them out in reporting the Flemish scythe as a very important addition to the agricultural implements of Scotland.

"Neither is it the occupier of an extensive portion of arable land who will alone profit by its use. It is well known that a great proportion of the small properties and farms in Scotland is cultivated almost solely by the family of the occupier. He neither possesses the means nor opportunity of commanding reapers in harvest, and to him such an instrument, uniting expedition and economy, must prove no small boon; in late and precarious seasons, not unfrequently amounting to the difference between saving and losing his crop."

"The following abstracts, which have been made on the basis of the information contained in some of the reports, and which, probably, may be assumed as pretty near the truth, will give a general view of the comparative expence of reaping by the Flemish scythe and by the sickle.

"Supposing the labour of the reaper with the scythe to be continued for ten hours, it may be fairly assumed that he will cut a quantity equal to that cut by two good reapers with the sickle in the same time. Rating harvest labour, then, at 3s. per day, the comparative expence of the two modes will stand thus:—

"2 men with the Flemish scythe, at 3s. per day, .	L. 0	6	0
1 man to bind, ...	0	3	0
The labour of a young person to make bands, and otherwise assist, at one-half the preceding rate, . .	0	1	6
Carry forward,	L. 0	10	6

Brought forward,		L. 0 10 6
4 reapers with the common sickle, at 3s.,	L. 0 12 0	
1 man can easily bind for six reapers, hence for 4 reapers 2-3ds of a day's labour will be required	0 2 0	0 14 0
Difference in favour of the Flemish scythe		L. 0 3 6

which is equal to a saving of 25 per cent. It is upon this principle that the calculation in the report from Berwickshire is founded."

From the Carse of Gowrie report, the calculation is as follows :—

" Cutting with the sickle 1 acre of wheat, producing 37 threaves, at 4d.,		L. 0 12 4
1 man binding and stooking		0 2 9
		L. 0 15 1
" With the Flemish scythe, 2 men cutting, at 2s. 9d. per day,	L. 0 5 6	
1 man binding and stooking	0 2 9	
1 woman making bands	0 2 0	0 10 3
Difference in favour of the scythe		L. 0 4 10

equal to a saving of 32 per cent."

From the Forfarshire report the statement is :

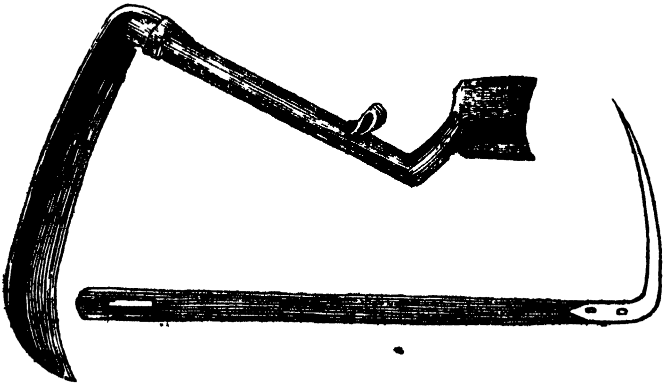
" 2 men cutting with the scythe, at 3s.		L. 0 6 0
1 woman making bands, &c.		0 2 6
1 man binding and stooking		0 3 0
		L. 0 11 6
4 men reaping at 3s.	L. 0 12 0	
1 man binding and stooking	0 3 0	0 15 0
		L. 0 3 6

equal to 23⅓ per cent. ; and, taking the medium of the three statements, the difference will be 26⅔ per cent. Other reporters, again, without furnishing details, calculate the saving at 1-3d, or 33⅓ per cent., which agrees nearly with the account from the Carse of Gowrie. Upon the whole, the Committee seem warranted, by the result of their inquiries, in assuming, that the saving by the use of this implement will be from 1-4th to 1-3d part of the ordinary expence of reaping by the sickle."

Such is the substance of the Report on the Hainault or Flemish Scythe; and, considering the favourable nature of that report, a somewhat different result might have been anticipated than has really occurred. But, although three years have elapsed since these experiments with the Hainault scythe were made, the instrument itself has nowhere come into general use.

That it is an important and useful mode of reaping, cannot be reasonably disputed; but we ought not, perhaps, to anticipate any important change in harvest work, until that great era (we hope not very remote) when the acquisition of a horse-machine, applicable to all ordinary circumstances, shall secure our crops, and sweep every prejudice before it.

This cut represents the implements for both hands.



DESCRIPTION AND PLAN OF A STEAM-BOAT FOR CONVEYING LIVE STOCK. *By Mr* PETER HEDDERWICK, *Marine Architect, Leith.*

I HAVE proposed a vessel of such a tonnage as will carry a considerable number of cattle with safety, and answer her sailing movements with dispatch; and I have at the same time shown methods of stowing the cattle, applicable to a larger or smaller vessel. Were two boats, each of half the tonnage of the one now proposed, to be desired, on account of some supposed advantage, the first cost of the two would exceed that of one of a tonnage equal to both. And although the nett surface of the decks of the two would exceed that of the large boat, yet the amount of broken stowage, from the narrowing of their bows and two sterns, and two larger spaces required for their engines, would counteract any advantage from their larger size, when united, but less convenient surface of deck.

But the same remark does not hold good, in comparing the advantages of a large vessel, say of 600 tons; because, independent of the great risk of such a vessel, she would not only draw too much water, but be very unmanageable at sea. Whereas one of about 400 tons will be easily navigated, and of such a size as will admit the most convenient method of stowing the cattle with the least loss of room. This is, therefore, about the size of the vessel I would propose for the conveyance of cattle. A smaller would not bear such a height without having her stability destroyed, and the ventilation and other conveniences would be less complete.

I have thought it unnecessary to offer any remarks on the locality of such places as it might be supposed the vessel would touch at, or her fitness to enter particular harbours, as the construction recommended is favourable for fast sailing, on a moderate draught of water. I have also refrained from offering any estimate of the probable expence of conveyance by the means proposed, as such statements can only be obtained by way of approximation, from persons who are in the immediate management of steam-boat companies.

[Mr Hedderwick sent to the Society two plans, exhibiting two methods of stowing the cattle. But as one of them is more particularly a working plan, it has been thought sufficient to lay before the public his most approved one, of which the following are the principal dimensions, and description of Plate. Any gentleman wishing a full detail as to all the particulars on the working plans, for building the vessel, may be furnished with the same, by applying to Mr Hedderwick.—Edit.]

DESCRIPTION OF PLATE V.

It seems unnecessary to enter here into a marine architectural description of the lines used in the constructing of the moulding plans of the vessel, or to give, at length, the necessary calculations which have been employed. The following is a statement of the principal dimensions :—

Dimensions of the Vessel.

	Feet	In.
Length of keel, ...	130	5
Rake of the main stem, . . .	10	0
Length of tonnage, . . .	140	5
Ditto on the main deck, . . .	138	0
Ditto on the lower deck, . . .	135	0
Breadth of the midship frame, . .	24	0
Ditto for tonnage, ...	24	8
Ditto extreme over the paddle-box, .	42	0
Depth of the hold from the deck to ceiling,	15	0
Height betwixt decks, . . .	6	8

Tonnage, as calculated by the above dimensions, 406 tons.

The vessel to be propelled by two engines of 65 or 70 horse power each.

Tonnage, after deducting the length of the engine-room from the full length, 238 tons.

	Tons.	Tons.
Estimated weight of the hull when ready for launching, .		255
weight of engines, boilers, coals, &c. . .	170	
weight of masts, anchors, passengers, &c. .	47	
weight of 160 cattle, with an allowance of water,	38	
		255
Total weight of the vessel when loaded, . .		510

	Feet	In.
Calculated distance of the centre of gravity from the stern-post at the keel, . . .	70	0
height of ditto above the under side of the keel,	13	6
distance of the centre of gravity from the stern-post, when loaded, . . .	74	6
height of the centre of gravity when loaded, .	11	0
mean draft of water when launched, . .	6	6
ditto when loaded and ready for sea, . .	9	10

Note.—The above results of calculation have been found to agree with experiments made with great care on the model.

[Having stated these dimensions, Mr Hedderwick then goes on to describe the plan and drawings, in which the cattle are arranged as standing in the fore and aft direction; and observes, that it makes little or no difference as to the number which may be carried at one time, whether they are stalled in the longitudinal or transverse direction as shown by the plate. He thinks the latter most convenient, as the cattle may be better ventilated, and as they will stand steadier when the vessel is in a heavy sea.—EDIT.]

Plate V. represents various plans and sections of the vessel, showing the mode of arranging the cattle. Fig. 1. is the longitudinal section, representing the vessel as if cut up the middle of her length by a vertical plane, extending from stem to stern, and exhibiting the height and front view of the stalls, &c. and sketch elevation of one of the engines.

The same letters are used in reference to the same parts in all the different figures on the plate.

Fig. 2. The semi-plan of the main deck, showing the arrangements of the stalls, &c. *b* the stalls, *c c* the cattle, *d d* the water-course.

Fig. 3. The half plan of the lower deck, shewing the arrangement of the stalls, and the plan of one of the engines. A, a store-room ; B, stalls ; C, the cattle ; D, the gutter or water-course ; F F, air-funnels from the outside of the vessel ; G G, the mouth of exhausting funnels for drawing the impure air, such as has become contaminated by the respiration of the cattle, from the fore and after hold, to near the furnace of the boilers, (*these exhausting pipes leading to that place, as shewn in the elevation*, fig. 1.), while the fresh air will be continually rushing into the hold through the funnels and transverse openings, made through the sides of the vessel, and thereby promote a free and regular circulation of fresh air in the stalls.

Fig. 4. is a transverse section of the vessel, at Frame, No. 10. ; The arrangement of the cattle is here obvious. F F are the air-funnels, from the outside of the vessel : these are placed at a considerable height above the surface of the water, as they must always be kept open when the cattle are on board. The space immediately above, marked R, will answer as a hay-rack or loft.

Fig. 5. A transverse section at the engine-room ; shewing the bed of the engine, the two cylinders and paddle-wheels.

Fig. 6. A transverse section of the fore-part of the vessel, at the transverse line, marked F in figures 1, 2 and 3. K is an opening or front through the side, for discharging wash from the deck. It is provided with a door or valve opening outwards, G G, the mouth of the exhausting ventilating pipe. J J, is a hatch or opening in the middle of the main-deck, the whole centre of which, as far as practicable, is left open ; but provided with gratings and overloophatches, in the Dutch manner, which may be kept up, or let down, at pleasure, (the ventilation being nevertheless complete). These openings or hatches are for the admission of air and light into the hold.

As respects the carrying of sheep or other small animals, I have marked off a few boxes or inclosures on the main-deck, fig. 2., for that purpose, where they will have the free air; and, if it is desired to carry a greater number than what these boxes will hold, I have considered that the height of the stalls (the height betwixt the decks) will be sufficient to hold two height of sheep, the upper tier being placed on boards placed in the middle of the height of the stalls.

The stalls are of sufficient size to hold, with ease, the fattest of the Highland cattle, taking them at about thirty-one or thirty-two stone each, which is perhaps the extent; and, accordingly, the vessel will carry 160 head, all properly stalled.

The construction of the stalls should be simple spars of wood, joined together on such a plan, that the sides or frames can be folded up towards the deck immediately above, in order that the cattle, to be placed near the bow and stern on the lower deck, may be first led to their respective places, and then the frame, which forms the sides of the stalls, let down at the side next the hatchway alternately.

The stalls can be so made, that they may be shifted, contracted, or enlarged, so as to answer cattle of a larger or smaller size; 160 properly stalled cattle may be shipped at one time; but if the partitions, which form the sides of the stalls, are folded up, and the cattle allowed to aggregate, which might safely be allowed in short passages, considering that there will be a very powerful ventilation in the hold, upwards of 200 head of cattle might be embarked at one time.

As for the number of sheep, when there are no oxen, we allow that five or six sheep will require the same surface of deck to stand upon as one ox, (which we may, when it is considered, that there will be many corners which would be unoccupied by the oxen, but which would hold a smaller animal, such as a sheep); then taking two height of sheep in each stall, and allowing 130 stalls, which can be filled in this manner, the number of sheep which could be carried, being placed in the stalls, will be 130 × 12 = 1560 head; but this is exclusive of what might stand on the main-deck, in the boxes made for the purpose. See fig. 2.

Having now shewn the arrangement of the stalls for the cattle, and the number which the vessel will accommodate at one time, it will be necessary to notice more particularly the mode of ventilation, in order to remove any doubts on that point.

In estimating the effect of the mode proposed from that produced by means of a baker's blowpipe, with which I made several experiments, I am fully convinced that the degree of rarefaction near the furnaces of two seventy-horse power steam-engines, will produce a draught through the exhausting funnels uncommonly powerful. I have calculated the contents of each hold *(the one before the engine and the other abaft it)* to be 7.500 cubic feet; and allowing the area of all the exhausting funnels or pipes to be 144 square inches, then the main velocity of the air through the pipes will be about nine or ten feet per second; and, supposing that ten feet is consumed per second, 10 × 60 = 600 feet consumed per minute; and 600 × 12.5 = 7.500; therefore, the whole air in the hold will be completely exhausted in twelve and a-half minutes. The exhausting pipes may be led into the furnace of the boiler or funnel; but only so as not to destroy the draught of the furnaces.

I shall not lengthen this description of our plan, by giving any farther calculations for the ventilation, or the quantity of fresh air to be supplied in proportion to the number of cattle, or the like; but merely observe, that all this has been duly considered. That we shall have an abundant and regular supply of fresh air into the hold, cannot be doubted by any person acquainted with the properties of atmospheric air, and the leading principles of pneumatics.

The funnels shewn in fig. 1. are placed to appear as obvious as possible; but, in place of using one or two large funnels, it is proposed to have a number of small ones, leading from near the under-side of the main deck, in order to draw very effectually the lighter air, which, from its levity, would float near the heads of the cattle, and under side of the main deck.

Should the above mode of ventilation be thought expensive, in so far as the cost of the ventilating pipes is concerned, it must be observed, that, although the transverse openings or pipes in the ship's sides, together with that space in the middle of the main deck which is left open, would be sufficient for ventilating the hold, in some cases; yet, in warm seasons, in calm weather, or in close damp atmospheres, it would completely fail. And the propriety of hazarding a number of cattle to the deleterious consequences of impure air, cannot, I should suppose, be found in the saving of a small expence in the first outfit of the vessel. But, indeed, the expence of putting in effective practice the principle above mentioned, with all necessary ramifications, will be trifling.

In favour of the method of ventilating the hold by the drawing off of the impure air by means of funnels, or pipes leading to the furnaces of the engine, to shew that we are right in our principle, I beg leave to notice a remark made by Sir G. O. Paul, in his Essay on Ventilation, communicated by letter to the Secretary of the Society of Arts. "I caused (says he) a stove to be so constructed, as to answer the culinary purposes of the ward in which it was placed (speaking of the ventilation of an hospital), and at the same time to ventilate the ward beneath it (and no additional expence is created by the operation). By a fire made in one of these stoves, a ward beneath it, containing about 1800 cubical feet, and filled with patients, and which, in spite of all former means, was very remarkably offensive, was, in a few minutes, so relieved of impure air, as to be very sensibly felt by all the patients in it."

After what has now been said respecting the accommodation of the cattle, when in the vessel, some particular method of taking them on board and unshipping them again must also be pointed out.

As the situation of many places where it may be required to embark the cattle, may be unfavourable for taking such animals on board, I would recommend having a strong wooden frame or box, the two ends to open like a door, being hinged to either side; the sides of the box to be five feet high. The box being placed on the quay, one end is opened, and the animal led into the box; the end, or door, is then shut and fastened with two bolts or pins. It is then slung by the four corners; a purchase is taken to the yard-tackle, or gaff, fitted for the purpose (to act as a crane). The box with the animal in it is now hoisted on board, and lowered down the hold; the door of the box opened, and the ox led to its proper stall. This is the process of taking them on board, and the reverse may be used for taking on shore again. But, if circumstances are favourable, the cattle may be led on board by means of an inclined plane, or sloping gangway, passing through a door in the vessel's side, above the main deck; also a sloping gangway may at times be used for taking the cattle down into the hold, or up from the same.

ON FORMS OF ACCOUNTS FOR CATTLE AND SHEEP STOCK. *In a Letter from Sir P.* MURRAY *of Ochtertyre, Bart. to Mr* GORDON.

SIR,

I HAVE to request that you will lay before the Directors of the Highland Society, the accompanying accounts of cattle and sheep stock. As this is the *form* in which these accounts have been kept at Ochtertyre, for twenty-two years, I am enabled to state, that I have, in *practice*, found them perfectly adapted to the purpose; and, as they appear to me to be equally *simple in the form*, and sufficiently *comprehensive* for embracing all the requisite details, I beg leave most respectfully to submit to the consideration of the Directors, whether it may not be advantageous to give these *forms* of accounts publicity, should the Directors be of opinion (as I humbly presume to think), that they are calculated for the benefit both of country gentlemen occupying farms, and for farmers.

It is my practice (as these accounts shew), to have them made up *half yearly;* but this is not necessary, as their *form* is equally adapted for YEARLY accounts. The half year accounts, however, which I inclose, are useful in exhibiting the manner of *transferring the stock* from one account (whether for the *half* year or the *whole* year), to the next succeeding account.

I beg leave, on the subject of *farm* accounts, to express my opinion of the great importance of inducing the occupants of land, whether as *proprietors* or *tenants*, to keep regular accounts of their receipts and payments. In order to render this practice *general*, it is essential that the *form* of their accounts should be as simple as possible. If country gentlemen kept *regular* accounts of the value of all the *family supplies* derived from the lands in their occupation, and of the *works* (exclusive of *farm*-work), performed by their farm-servants and horses, it would be proved that the occupation, cultivation, and improvement of land is not so expensive a concern as it is usually conceived to be. The contrary opinion is so prevalent, that it both limits the extent of the farming operations of gentlemen who are engaged in them, and prevents others from engaging in them,—consequences which are much to be regretted, both as limiting and retarding the general agricultural improvement of the country, and as lessening the inducements of landed proprietors, and others, to RESIDE IN THE COUNTRY, and employing their time and capital towards its cultivation and improvement,—objects which, in every point of view, are obviously of the greatest national importance in all countries. I have the honour to be, Sir, your most obedient servant,

PAT. MURRAY.

36. MORAY PLACE,
2d December 1828.

CATTLE STOCK ACCOUNT for One-half Year, commencing 15th May 1819 *and ending 11th November* 1819.

No.	STOCK transferred from last ACCOUNT.	TOTAL VALUE.		SOLD.			CONSUMED.				LOST OR DEAD.			IN STOCK.		
		Each. £ s. d.	£ s. d.	No.	Each. £ s. d.	£ s. d.	No.	Sts. ℔.	Rate ꝑ Stone.	£ s. d.	No.	£ s. d.	£ s. d.	No.	£ s. d.	£ s. d.
9	Milch cows, ...	10 0 0	90 0 0	2	8 10 6	17 1 0	...	...	...	...	...	...	...	7	10 0 0	70 0 0
1	Bull seg, ...	12 0 0	12 0 0	1	14 13 0	14 13 0	...	...	...	...	...	...	...	...	...	...
1	Stot, home breed, . . .	17 0 0	17 0 0	1	21 13 0	21 13 0	...	...	...	...	...	...	...	...	...	...
1	Bull, do.	10 0 0	10 0 0	...	...	...	...	...	...	...	...	...	...	1	12 0 0	12 0 0
2	Stots, do.	10 0 0	20 0 0	...	...	...	...	...	...	...	...	...	...	2	12 0 0	24 0 0
7	Queys, do.	10 0 0	70 0 0	4	10 19 6	43 18 0	1	31 10	@ 9/4	14 15 2	...	...	...	2	10 0 0	20 0 0
2	Stots, do.	7 0 0	14 0 0	...	...	. .	...	...	...	...	...	...	...	2	10 0 0	20 0 0
7	Queys, do.	7 0 0	49 0 0	5	6 13 9½	33 9 0	...	...	...	...	...	...	...	2	10 0 0	20 0 0
3	Stots, do.	4 0 0	12 0 0	...	...	...	...	...	...	...	...	...	...	3	7 0 0	21 0 0
9	Queys, do.	4 0 0	36 0 0	1	6 3 0	6 3 0	...	...	...	...	...	...	...	8	7 0 0	56 0 0
10	Stots bought 1st Doune market, ...	6 6 0	63 0 0	...	...	...	...	...	...	...	...	...	...	10	9 0 0	90 0 0
5	Stot calves, home breed,	0 10 0	2 10 0	...	...	...	...	...	...	...	...	...	...	5	2 0 0	10 0 0
4	Quey calves, do. . .	0 10 0	2 0 0	...	...	...	...	...	...	...	...	...	...	4	2 0 0	8 0 0
3	Bull calves, do. . .	0 10 0	1 10 0	...	...	...	1	6 0	@ 9/4	2 16 0	...	...	...	2	2 0 0	4 0 0
3	Stots from Carsehead, .	12 0 0	36 0 0	...	...	...	2	51 4	@ 9/4	23 18 4	...	...	...	1	12 0 0	12 0 0
9	Stots from 2d Doune market, ...	9 0 0	81 0 0	...	...	...	6	131 12	@ 9/4	61 9 8	...	...	...	3	10 0 0	30 0 0
76		...	516 0 0	14	...	136 17 0	10	220 10	...	102 19 2	...	...	. .	52	...	397 0 0
	Bought since Whitsunday,															
1	Low country breed at Turret market, .	7 10 0	7 10 0	...	...	...	...	...	...	...	...	...	...	1	8 0 0	8 0 0
77			523 10 0	14	...	136 17 0	10	220 10	...	102 19 2	...	...	...	53	...	405 0 0
	Hides and tallow, . . .	. . . .	. . . . .	. .	. . . .	17 9 7										
						154 6 7										

CATTLE STOCK ACCOUNT for One-half Year, commencing 11th November 1819 *and ending 15th May* 1820.

No.	STOCK transferred from last ACCOUNT.	TOTAL VALUE.		SOLD.			CONSUMED.				LOST OR DEAD.			IN STOCK.		
		Each. £ s. d.	£ s. d.	No.	£ s. d.	£ s. d.	No.	Sts. lb.	Rate ⅌ Stone.	£ s. d.	No.	£ s. d.	£ s. d.	No.	£ s. d.	£ s. d.
9	Milch cows, ...	10 0 0	90 0 0	...	...	...	...	...	...	...	...	..	...	9	10 0 0	90 0 0
1	Bull, home breed, . .	12 0 0	12 0 0	...	...	...	...	...	...	...	...	...	...	1	14 0 0	14 0 0
2	Stots, do.	12 0 0	24 0 0	2	15 15 0	31 10 0	...	...	...	...	...	..	...	...	...	...
2	Stots, do.	10 0 0	20 0 0	...	...	...	...	...	...	...	...	...	...	2	12 0 0	24 0 0
3	Stots, do.	7 0 0	21 0 0	...	...	...	...	...	...	...	...	...	...	3	8 0 0	24 0 0
8	Queys, do.	7 0 0	56 0 0	...	...	..	...	...	...	...	...	...	...	8	8 0 0	64 0 0
10	Stots bought 1st Doune market, ...	9 0 0	90 0 0	...	...	...	6	139 3	@ 9/4	64 19 1	...	...	...	4	10 0 0	40 0 0
5	Stots, home breed, . .	2 0 0	10 0 0	...	...	...	...	...	...	...	...	...	...	5	3 10 0	17 10 0
4	Queys, do.	2 0 0	8 0 0	...	...	...	...	...	...	...	...	...	...	4	3 10 0	14 0 0
2	Bulls, do.	2 0 0	4 0 0	...	...	...	...	...	...	...	...	...	...	2	3 10 0	7 0 0
1	Stot from Carsehead, .	12 0 0	12 0 0	...	...	...	1	29 1	@ 9/4	13 11 3	...	...	...	...	...	...
3	Stots from 2d Doune market, ...	10 0 0	30 0 0	...	...	...	3	84 9	@ 9/4	39 9 3	...	...	...	...	...	...
1	Low country breed, . .	8 0 0	8 0 0	1	8 8 0	8 8 0	...	...	...	...	...	...	...	...	...	...
2	Queys, home breed, . .	10 0 0	20 0 0	...	...	...	...	...	...	...	...	...	...	2	10 0 0	20 0 0
53		...	405 0 0	3	...	39 18 0	10	252 13	...	117 19 7	...	...	...	40	...	314 10 0
	Reared since Martinmas,															
5	Quey calves, home breed,	0 5 0	1 5 0	...	...	...	...	...	...	...	1	dead, not	for use.	4	0 10 0	2 0 0
6	Stot calves, do. . .	0 5 0	1 10 0	...	...	...	...	...	...	...	...	..	...	6	0 10 0	3 0 0
	Bought since Martinmas,															
1	Low country breed, . .	8 10 0	8 10 0	...	...	...	...	...	...	...	...	...	...	1	8 10 0	8 10 0
65		...	416 5 0	3	...	39 18 0	10	252 13	...	117 19 7	1	...	...	51	...	328 0 0
	Hides and tallow, . . .	. . .	. . .	. .	. . .	18 6 0										
						58 4 0										

SHEEP STOCK ACCOUNT, for One-half Year, commencing 15*th May* 1819 *and ending* 11*th November* 1819.

No.	STOCK transferred from last Account.	TOTAL VALUE.				SOLD.					CONSUMED.							LOST OR DEAD.					IN STOCK.				
		Each.	£	s.	d.	No.	Each.	£	s.	d.	No.	Sts.	lb.	per Stone.	£	s.	d.	No.	Each.	£	s.	d.	No.	Each.	£	s.	d.
46	Ewes, Leicester breed, .	@ 28/	64	8	0	2	@ 34/	3	8	0	...	...		...	...			...	...	...			44	@ 28/	61	12	0
9	Ewes, Dorsetshire do. .	@ 28/	12	12	0	...	...	...			...	...		...	...			...	...	...			9	@ 28/	12	12	0
2	Tups, Leicester do. .	@ 50,	5	0	0	...	...	...			...	...		...	...			...	...	...			2	@ 50/	5	0	0
3	Tups, cross do. .	@ 35/	5	5	0	3	@ 42/	6	6	0	...	...		...	...			...	...	...			...	...	...		
4	Dinmond's Leicester do. .	@ 30/	6	0	0	4	@ 33/3	6	13	0	...	...		...	...			...	...	...			...	...	...		
14	Do. cross do. .	@ 30/	21	0	0	14	@ 33/8½	23	13	0	...	...		...	...			...	...	...			...	...	...		
18	Wethers, do. do. .	@ 30/	27	0	0	18	@ 39/8¼	35	14	6	...	...		...	...			...	...	...			...	...	...		
7	Ewes, do. do. .	@ 28/	9	16	0	...	...	...			...	...		...	...			...	...	...			7	@ 28/	9	16	0
47	Ewes, Highland do. .	@ 15/	35	5	0	9	@ 20/	9	0	0	...	...		...	...			...	...	..			38	@ 15/	28	10	0
10	Wethers, do. do. .	@ 25/	12	10	0	...	...	...			8	25	2	@ 9/4	11	14	6	2 dead, not for use.					...	...	...		
10	Wether hogs, Leicester do.	@ 20/	10	0	0	...	...	...			...	...		...	...			...	...	...			10	@ 25/	12	10	0
13	Ewe do. do. do.	@ 20/	13	0	0	...	...	...			...	...		...	...			...	...	...			13	@ 25/	16	5	0
1	Wether do. cross do.	@ 20/	1	0	0	...	...	...			...	...		...	...			...	...	...			1	@ 25/	1	5	0
5	Ewe do. do. do.	@ 20/	5	0	0	...	...	...			...	...		...	...			...	...	...			5	@ 25/	6	5	0
107	Lambs of different breeds,	@ 5/	26	15	0	45	@ 12/2	27	8	5	30	50	3	@ 9/4	23	8	5	...	...	...			32	@ 12/	19	4	0
72	Wethers, Highland breed,	@ 25/	90	0	0	20	@ 25/3	25	5	0	24	75	13	@ 9/4	35	7	7	...	...	...			28	@ 25/	35	0	0
368			344	11	0	115		137	7	11	62	151	2		70	10	6	2	...	...			189	...	207	19	0
	Bought since Whitsunday																										
63	Wethers, Highland breed from Callender, . .	@ 18/	56	14	0	...	...	...			...	...			...			...	...	...			63	@ 18/	56	14	0
43	Ewes, do. do. do. . .	@ 10/	21	10	0	...	...	...			...	...			...			...	...	...			43	@ 10/	21	10	0
474			422	15	0	115		137	7	11	62	151	2		70	10	6	2	...	...			295	...	286	3	0
	Skins and Tallow, . . .	. .	. . . .			.	. .	7	16	3																	
								145	4	2																	

SHEEP STOCK ACCOUNT, *for One-half Year, commencing 11th November* 1819 *and ending 15th May* 1820.

No.	STOCK transferred from last Account.	TOTAL VALUE.				SOLD.					CONSUMED.							LOST OR DEAD.					IN STOCK.				
		Each.	£	s.	d.	No.	Each.	£	s.	d.	No.	Sts.	lb.	℔ Stone.	£	s.	d.	No.	Each.	£	s.	d.	No.	Each.	£	s.	d.
57	Ewes, Leicester breed, .	@ 27/3¾	77	17	0	7	@ 28/3¼	9	18	0	...	...		...		...		...	...		...		50	@ 28/	70	0	0
9	Ewes, Dorsetshire do. .	@ 28/	12	12	0	...	...		...		...	...		...		...		...	...		...		9	28/	12	12	0
2	Tups, Leicester do. .	@ 50/	5	0	0	...	...		...		...	...		...		...		...	...		...		2	50/	5	0	0
10	Dinmonds, do. do. .	@ 25/	12	10	0	...	...		...		1	3	12	@ 9/4	1	15	0	...	...		...		9	30/	13	10	0
2	Wethers, cross do. .	@ 26/7½	2	13	3	...	...		...		...	...		...		...		...	...		...		2	30/	3	0	0
11	Ewes, do. do. .	@ 26/7½	14	12	9	6	@ 30/	9	0	0	...	...		...		...		...	...		...		5	28/	7	0	0
38	Ewes, Highland do. .	@ 15/	28	10	0	38	@ 15/2 nearly.	28	16	0	...	...		...		...		...	...		...		..	...		...	
3	Tup hogs, Leicester do. .	@ 12/	1	16	0	...	...		...		...	...		...		...		...	...		...		3	20/	3	0	0
14	Wether do. do. do. .	@ 12/	8	8	0	...	...		...		...	...		...		...		...	...		...		14	20/	14	0	0
15	Ewe do. do. do. .	@ 12/	9	0	0	1	@ 21/	1	1	0	...	...		...		...		...	...		...		14	20/	14	0	0
28	Wethers, Highland do. (old), ...	@ 25/	35	0	0	8	@ 28/8¼	11	9	6	18	54	13	@ 9/4	25	11	7	...	...		...		2	25/	2	10	0
63	Wethers, Highland do. (young), ...	@ 18/	56	14	0	...	...		...		13	38	2	@ 9/4	17	15	10	1 lost, two was shot at the time.					49	25/	61	5	0
43	Ewes, Highland do. .	@ 10/	21	10	0	...	...		...		...	...		...		...		...	...		...		43	12/	25	16	0
295			286	3	0	60	...	60	4	6	32	96	11		45	2	5	1	...		...		202	...	231	13	0
	Reared since Martinmas																										
111	Lambs of different breeds,	@ 5/	27	15	0	...	...		...		10	11	2	@ 9/4	5	3	10	...	...		...		101	@ 5/	25	5	0
460			313	18	0	60		60	4	6	42	107	13		50	6	3	1	...		...		303		256	18	0
	Skins and Tallow, . . .	. . .	. .			.	. . .	5	14	10½																	
								65	19	4½																	

ON THE NATURE OF SOILS AND SUBSOILS, AS INDICATED BY THEIR SPONTANEOUS PRODUCE. *By the Rev. Dr Singer, Kirkpatrick-Juxta.*

[The views of Dr Singer on this subject are expressed in the following Notes.—Edit.]

1. *Green Mountains*, like those of Cheviot and Ettrick Forest, abounding in grass without heath, indicate a strong soil, which is rendered productive, though frequently steep and elevated, by a retentive subsoil. This quality, and the frequent mists and showers that visit rather elevated sheep-walks, render them productive in strong grasses (many of which are of the bent or *Agrostis* genus), nourishing a strong and large breed of sheep, but requiring strict attention to draining, and also to shelter and provender in times of deep snow; and with these and other necessary precautions, even a glance of these green mountains will induce the active and intelligent store-farmer to stock with the fine-wooled breed of Cheviot sheep, and to guard against the rot.

2. *Dark Mountains*, clothed with a mixture of heath and grass, indicate a drier soil, on a less retentive subsoil, adapted for any of the mountain flocks of a hardy character, and fitted to rear healthy sheep, but not to raise them to a great weight. Such are many of the Highland mountains; and such also are some of those which appear occasionally among the green mountains of the southern pastoral district, in which the light soil is incumbent commonly on gravel or porous rock, and where the heath requires, when it becomes too strong, to be destroyed by fire, that young and edible plants of heath may rise from the roots. On such a soil, the flock may be visited by sickness or braxy, but the rot seldom appears.

3. On these darker-coloured mountains a green and *grassy part* often appears, where there is no heath, and the subsoil

is retentive; and if the upper edge of such a spot appears well defined, this is occasioned by the regular approach of a stratum of clay, or other substance impervious to water, towards the surface; and this green hue disappears below, when the subsoil again becomes open. If a line of rushes appears at the upper edge of this greener part of the hills, or a considerable body of rushes grows below, the soil has been rendered wet and miry, by an outburst of water thrown up by the subsoil, and may require draining.

4. On any of the mountains, whether dark or green, when the *Fern* or *Braken* appears in quantities, it indicates a deep soil, and a dry subsoil, where the hand of culture may be well repaid, if otherwise answerable to the farmer's views, and if there be not blocks of stone below; but when these occur in spots covered by the fern or braken, the landholder finds one of the best of soils for plantations of forest trees.

5. The summits of many green mountains are composed of irregular, and frequently *deep mosses*, indicated by quantities of heath, deer-hair (Scirpus cæspitosus), and bog cotton (Eriophorum), such a soil being commonly accumulated over a clay or other retentive subsoil.

6. In the dales below, it may be at once determined, that where the *Broom* (Spartium scoparium) abounds and prevails, there is a light and gravelly soil and subsoil, adapted for cultivation, but requiring frequent refreshment by manures and pasture.

7. The *Whin* prevails on coarser and stronger soils, containing clay, or incumbent on till, and requiring to be meliorated by culture and manures, especially by due exposure in fallow, after which they repay well. This plant (the Ulex europæus) is often found on soils incumbent on retentive rock as well as on hard clay.

Both of these, the broom and the whin, are weeds in lands in course of cultivation; but in hill-pastures and waste lands, they furnish a proportion of food to stock, and also shelter for them, and even for game.

8. Dry soils, by long neglect, and naturally barren, become in time covered with *strong crops of heath*, and the unconsumed remains of this plant render the soil more and more spongy. The fire consumes part of this, and young heath plants in a short time appear, which may be of use for sheep and cattle. But lime applied to such a soil, assisted by fire, destroys the strong heath, and nourishes grass and white clover in the medicated soil. It is not easy to conceive any improvement greater than this; and in many parts it is practicable at a moderate expence, though neglected too much.

9. Large tracts of strath or dale lands become in time rather *mossy at the surface*, merely by the growth and accumulation of plants not consumed by any animal, and not burned off. This occurs on soils rather disposed to be retentive, and in moist climates also, which, by surface-draining, burning in season, and proper stocking and management, may be rendered more fertile. Heath is the most common plant here, and the bent grasses, neither of them very abundant; but intermixed with these are many other plants, especially the deer-hair.

10. When the *Rush* (Juncus conglomeratus) prevails in quantities, the soil is miry, from excess of water, but not unfertile; and the common *sprit* (Juncus articulatus) indicates a similar soil, hardly so good. These plants, indeed, often grow intermixed; but wherever they prevail, they indicate a neglected soil, capable of being turned into meadow lands, for hay or pasturage, and then fitted to support a good stock of cattle of large size.

11. When any soil produces little else than short and poor *stunted heath*, such a produce indicates a soil rendered barren by the flaughter or paring spade; or, from its bad spongy quality, and want of depth, too poor to nourish a crop. The same appearance occurs in soils incumbent on a metallic sub-

soil, hostile to vegetation, or consisting of poor hungry gravel, or drowned with water; and the remedy is often expensive, sometimes rather uncertain.

12. The prevalence of sweet gale (Myrica Gale), indicates a wet spongy moss, in itself of inferior value, and not easily medicated to any purpose.

13. In low lands, covered with strong heath of the common kind, intermixed with bell heather and bog cotton, indicating a body of peat-moss formed on a subsoil of clay or other retentive substance, an excellent opportunity occurs for turning the barren moss into peat-earth, by improvement, and thus forming *a meadow*, by draining, levelling, paring and burning, digging and manure,—one of the greatest of all improvements, by which the soil and climate are both altered.

14. On elevated *mountain* sides, the shepherd finds the *Crowberry* (Empetrum nigrum), and also the *Cloudberry*, or mountain bramble (Rubus chamæmorus), in mossy soils, not commonly very deep, and rather moist. When spots of deeper peat-moss have consolidated by time, or other cause, in similar situations, they are often productive of quantities of the *Fly bent* (Sesleria cœrulea), which affords nourishing food for cattle. In any elevation, and on mountain sides, the *Wire bent* (Nardus stricta) indicates a peat soil below. In the wet spongy peat-mosses in the vales, the *Cranberry* (Vaccinium oxycoccus) appears; and in mossy banks the *Blaeberry* (Vaccinium Myrtillus). But all these plants may appear in more or less quantities, according to stocking and management.

15. In *forest lands*, the Scots fir grows naturally in dry, and often in rather poor soils; and this observation corresponds with what has occurred in foreign regions as to pine barrens. The oak, ash, and elm prosper in deep loamy soils. The alder appears in quantities by the margins of rivers in alluvial soils, near water. The poplar and willow indicate a moist soil; the birch and hazel a dry gravel.

16. An *arable field*, covered with a strong crop of ragweed (Senecio Jacobæa) will be found to consist of good loam, fit for any crop, and not properly stocked in pasturage, unless there be such a proportion of sheep as to eat and keep down this rank weed; for which the new Leicester or Dishley breed is well adapted. A forest of way-thistles (Carduus arvensis) indicates a good, rather strong soil, neglected, and wanting to be drained and cleaned. The meadow thistle (Carduus palustris) grows in lands adapted to meadow grass. Common docks (Rumex obtusifolius), with mugwort (Artemisia vulgaris), infest good soils, in places not correctly cultivated. Sorrel (Rumex acetosa) abounds in light soils, and corn sow-thistle (Sonchus arvensis) in clay soils, not properly cleared of weeds when in culture. Dead-nettle (Lamium purpureum), wild kail (Raphanus Raphanistrum), and corn marigold (Chrysanthemum Segetum), may be expected in light soils, imperfectly cleared and laid down. Corn spurry (Spergula arvensis) is found most frequently in soils rather moist, and not completely fallowed. The great white ox-eye (Chrysanthemum Leucanthemum), which is a congener of the corn marigold, but a more pernicious weed, being a perennial, continues to grow in light soils, in which it has got a place, and from which it has not been extirpated. The common nettle (Urtica urens) is very seldom if ever found, excepting in places where man has inhabited, and it commonly appears in a loamy soil. The wild mustard (Sinapis arvensis) appears in good soils, where there is plenty of manure. When chickenwort grows in strength, whatever the nature of the soil is, it shews that it is in a state of improvement, and that, when cleaned of weeds, it is fit for bearing crops.

17. In *mossy* soils, the Yorkshire fog (Holcus lanatus) delights, when of a light flowy character, and duly improved; when the moss is more solid, with a mixture of clay, Timothy grass (Phleum pratense) prospers; and when richly manured, they suit the rough-stalked meadow-grass (Poa trivia-

lis); but when rather poor, they still nourish the waving hair-grass (Aira flexuosa) and the sheep's fescue (Festuca ovina.)

18. Meadows which in May discover a large quantity of marsh-marigold (Caltha palustris), or of the wild water cress (Sisymbrium Nasturtium), may be considered fully or over-watered.

19. Pastures in which the white clover and daisy prevail, and seem to thrive, have been either naturally or by art manured with lime or marl; and pastures full of grass, but without these plants, require to be so manured. Meadows well stocked with natural red clover (Trifolium medium), have calcareous matter already in them. If the yarrow (Achillea Millefolium) abounds in any pasture land, it shews a deep soil; and the meadow-foxtail (Alopecurus pratensis) indicates a soil deep and moist.

20. The common rattle (Rhinanthus Crista-Galli) abounds in exhausted and poor meadow soils, requiring to be manured; and the pry (Carex dioica), in meadows below which there is water stagnating and requiring to be drained off.

21. Even when the snow covers the mountains, the traveller occasionally sees on their sides, here and there, a tree of the white thorn; and he may conclude, wherever they appear, that there is a kindly dry soil, inclined to loam.

Some intelligent farmers are already, in practice, accustomed to form a judgment of soils from the nature of the spontaneous produce; and this communication may be of some use in leading to do this on correct principles. It is a subject of great importance to the landholder and his factor; and it may be more and more useful as it is correctly investigated, and as light is thrown upon it by successive communications. The geologist can tell, by a glance of his eye directed to the particular shapes of mountains, not a little of their conformation and contents; but the agriculturist attends also to their spontaneous produce, and from this, in connection with climate and other circumstances, he forms a general opinion of their quality in respect of soil; never, however, fixing his opinion of uncultivated soils, without attending particularly to the numbers, quality, and management of the live stock; and of soils in cultivation, always deeming it proper to consider the course of management, the crops produced, and also the spontaneous produce, in so far as it appears.

In lands much cultivated and long cropped, the couch-grass (Triticum repens) abounds; and this weed is to be got under by clean dressing, and by at least three years of pasturage. The wild mint (Mentha arvensis) is a great annoyance in gardens and fields long in culture; but by due attention to take out the roots in spring, and especially by digging about or after Lammas, it is destroyed. The corn chamomile (Anthemis arvensis) occasions great trouble, even in good and well manured but long cultivated soils; requiring uncommon attention to keep it down, and, like the noxious perennial which resembles it in flower, though not in leaf (the Chrysanthemum Leucanthemum), hardly to be got rid of without correct fallowing and sowing down, followed by hand-weeding in the young grass, before these weeds have become strongly rooted, or the seeds of any of them have been allowed to propagate in the grass. The old story of some landholders holding meetings to inspect lands, in order to prevent the growth of gule (corn marigold), is well known; and it often infests light soils too much cropped, almost to the total ruin of the corn among which it grows. The indications of the soil from spontaneous produce, in lands either longer or shorter in tillage, though not very certainly nor clearly made, are yet in some degree practicable, and will become daily more easy to an experienced and attentive observer.

Essay *by Mr W. Hogg, Shepherd, Stobo, Peeblesshire.*

[The Essay of this author contains a detail of his observations, made chiefly in Ettrick Forest, Annandale, and Tweeddale. Specimens of the plants alluded to in the text, by their provincial names, were sent along with the manuscript, which has enabled us, in most instances, to ascertain their general or scientific names. The part of the Essay now published relates chiefly to mosses or peat soil, which the author has had very favourable opportunities of observing, and to the improvement of which our regards ought to be very especially directed; for it is not to be forgotten that the formation of peat is the process by which, in the evolution of time, men, and the creation that serves him, are gradually extirpated from certain latitudes, if Nature be left to herself.—Edit.]

On a Mossy Soil.

Moss is a substance which prevails to a great extent in the elevated districts of this country. Wherever plants, grasses, &c. fall into decay, their remains are always formed into moss, if the change is not opposed by some more powerful cause. The causes which resist the formation of moss, proceed primarily from the soil and climate, and subsequently from that general plan of management which the climate and soil have induced man to adopt, in order to secure from them the greatest possible advantage. Though the climate and soil, when uncontrolled, naturally produce moss, yet they also furnish the means of partially counteracting its immediate formation: whenever heavy and long rains occur, they wash from higher fields, or bring from the interior of hills, immense quantities of sand, which, scattered over the surface, enters into the remains of decayed plants, and prevents their combination into a moss or peaty substance. Besides, sand has an earthy and germinating quality, which strongly resists the formation of dead inert soils, and excites the vegetable mould to shoot forth its productions vigorously. The obstructions which man gives to the formation of moss are, his stocking the hills and dales with various kinds of animals (which eat up the grasses while in their verdure, and thus prevent them from falling into decay), and his working the surface of the ground for the purposes of agriculture, which entirely removes the least tendency to moss.

The most powerful cause for the formation of moss in this country, was the destruction of its vast forests by the Roman armies, and the gradual waste of them in subsequent ages. The ruin of the woods of Scotland occurring at a period when our rude ancestors were strangers to the arts of civilized life, and when the productions of the soil beyond what were necessary for subsistence, were of no value, the fallen timber was abandoned to damp and rot. The trees and their bushy tops smothering up the surface of the ground, cherished the growth of the musci and algæ tribes; and when these were decomposed in their turn, they added a new layer of moss. This was a cause in the formation of moss which none of the operations of nature unassisted by art could counteract; and such extensive fields of moss were then formed, that their influence on other soils continues at this time to be altogether irresistible.

That the destruction of the Caledonian forests was the primal cause of moss, scarcely admits of a doubt. I have frequently seen at the bottom of mosses, four, five, and six feet deep, large trunks of trees, with their roots still fixed in the subsoil. The body of the tree and its branches had been smashed down on the spot, and were sticking in the moss,—which plainly testified that the tree had occupied the same situation previous to the existence of the moss. As a proof that fallen timber generates moss, and also that moss is very rapid in its formation, the following fact, which is recorded in the fourth volume of the *Philosophical Transactions*, may be quoted: In the year 1651, the Earl of Cromarty was occasionally in the parish of Lochburn. Going from Achadiscald to Gennaza, he went by a very high hill, about half a mile from the base of which there was a plain half a mile in circuit. This plain was at that time covered with a firm standing wood, the trees were very old, and had no green leaves, nor any bark on them. About fifteen years afterwards, the Earl happened to pass by the same place, and there was not a tree standing, but the plain was covered with a green moss. The country people told him that the trees were all blown down, and that nobody was at the pains to carry them away; that now no one could cross the place, as the fog or moss, forming over the trees, did not afford a safe footing or support. The Earl, however, would needs try, and falling in to the arm-pits, he was helped out again by those who witnessed the experiment. Before the year 1699, the whole plain was turned into a common moss, and the country people were digging turf and peats out of it. Now here was a piece of ground covered in less than half a century, with a solid moss of considerable thickness (for it must have been two feet deep, else they could not have cut peats from it), and of which the fallen timber was the only cause.

This singular substance (moss) has excited the curiosity of naturalists, and opposite theories have been formed concerning its origin and qualities. Having stated what is the most powerful cause of its formation, it shall be our next business to say in what states it is found at present, and how it affects earthy soils, with which it comes in contact, and with which it is mixed in various degrees.

First, We find it in a living or quick state, when it is called a *Flow* or *Flow-moss*; that is, it is increasing in deepness, and also protruding itself on every side.

Secondly, We find it in a state of complete ripeness, when it is called by the country people a *Broken Moss;* that is, its surface is broken up by the agency of the elements, and it is in a state of waste and decay.

Thirdly, We find it mixed with earthy soils in every degree of proportion.

And, lastly, We find it covering the surface of lea-soils, where a stunted heath generally prevails. In this last situation it is always in a dry powdery state.

Flow, or *Flow Moss.*—Moss, immediately upon its formation, enters upon a quick or living state, and, so long as it is within the influence of an earthy soil, rapidly increases in extent and deepness. If it be upon a level spot (which we here suppose it to be), the stagnation of wet and damp continues the growth of the musci and algæ tribes long after the earthy stratum upon which the bed of moss is formed has ceased to push forward its peculiar plants. These last are the rush, sprat, paddock-pipe; and if the wet which nourishes the marsh be of the nature of a spring, much buckbean, or marsh-trefoil: these are the rudiments of the moss; but when the earthy stratum has lost its influence, they entirely disappear, and the families of the musci and algæ begin to show themselves. The remains of these and of other sphagni give annually an additional layer to the marsh, which now begins to turn consistent and firm; and if no plan is taken to withdraw that excess of damp, which swells the moss and enlarges it on either side, its tendency to increase, in process of time, would defeat the principles upon which the moss depends.

While moss continues to grow, it greedily resumes the remains of its annual produce into its own substance; but transmits almost none of its qualities to the adjacent grounds.

Broken, or *Ripe Moss.*—Large tracts of moss are also generated on acclivities and the sloping sides of hills. The detention of water is here difficult; and, of course, those plants which an earthy subsoil sends up amid an excess of stagnant water are here wanting. A dwarfish heath, deer-hair, all the kinds of bent, and a kind of *fog*, are here the plants from which the moss originates. These attempt to lay the foundation of vegetation; but as the situation is cold, elevated, and infertile, they fall into decay, and their remains are slowly changed into moss. The moss ripens as it advances. As it approaches maturity, all these productions disappear; and the heath and fog usurp the whole surface. The bed of moss, from its very beginning, is here a black, soft, pulpy substance, without a single root or fibre. In this state it cannot long resist the united effects of rain and frost. In such exposed situations, and in a high latitude, the former is excessive, and the latter acts with great intenseness. These soon break open its surface into deep gullies, which the country people call *hags*; and no person but those who have often seen a wild mossy glenhead, can rightly conceive the number and depth of these *hags*: several thousands of them will sometimes intersect a moss of no great extent, provided it has been fully ripe, and formed on a declivity. The moss being now fairly broken, every succeeding winter's frost reaches deeper and wider into these gullies; and wherever it penetrates, it completely decomposes and separates the parts of the moss, leaving it, when dry, to be blown about by winds, or washed down the gullies by rains. This last operation will, during a day of great rain, carry thousands of tons down the main stream which descends from the mossy wild. Great part of this is no doubt hurried forward till the mossy particles can no longer be distinguished in the large collection of waters which swell the stream; yet, on whatever lands these waters float over, they leave a sediment tolerably enriching. The deposition, however, is doubly fertilizing, if the mossy stream has made a junction with another in which particles of primitive earth and small sand are floating. But it is on the land that intervenes between the moss and the stream that the principal deposits are left. These somewhat correct the soil by suppressing fog, &c.; but that it is not effectual for suppressing every unsubstantial production, the reader will understand from the following observations.

Moss may be called an adventitious soil, incapable of producing either plants or grass proper for the support of man or beast. As its surface gradually rises beyond the influence of the earthy soil upon which it is formed, its productions by degrees lose their verdure; and even the algæ and musci families (which are imperfect plants themselves), as the moss ripens, gradually disappear, and nothing remains but an old stunted heath and fog; and even these are on the point of relinquishing it also, when the moss is broken up by the united agency of the elements, as mentioned above. As the frost penetrates the moss, it completely destroys the original conformation of its parts, and brings it to a dry powdery state. It is then scattered over other soils, continuing in the same inert state as when it was an integral part of the unbroken moss, but only, by the decomposition of its original texture, fitted to enter into and unite with the earthy soils with which it comes in contact, which, previous to its dissolution by frost, it was incapable of doing. Hence the reason why moss, when scattered loosely by the elements over any extent of a different soil, is found ineffectual for rectifying its depravity. The herbage which already covers the fields prevents it from mixing with the purer earths, and it is washed by water and blown about by winds until its inherent qualities are entirely wasted and dissipated. But no sooner does it combine with earthy soils than it communicates to them a vegetative strength. The plants now produced are peculiar to that soil, which is a combination of earth and moss. This was above stated to be a third state in which moss is formed, and we now go on to describe it.

Water is the most common and the most powerful agent employed in the combination and decomposition of different strata. It deposites earth and sand as it floats over the surface, and it communicates also some of its qualities as it flows between the upper and sub-stratum; and as moss stands full of damp from top to bottom, it never ceases, even in the greatest drought of summer, to transmit a cold distillation to all the ground below its level and within its influence. These transmissions are most abundant after rains; but they are more efficient and strong during summer, when they more resemble a juice that exudes from the moss, than an emission of wet which the moss cannot retain. As they are strongly impregnated with the qualities of moss, it is not long till they give the earthy particles, through which they distil a mossy tincture, and in reality a mossy quality. The continued discharge of this fluid into a lea-soil would in process of time entirely change it into a bed of moss; but very often, before this is fully accomplished, that redundance of water and damp which the moss continually sends out, forms for itself small subterraneous channels between the upper and sub-stratum; the excess of moisture is conveyed along these, and is thus prevented from communicating its qualities to the surface-mould, as it would do, if allowed to ooze through and leisurely settle in it.

And here we may mention the process observed by Nature in changing earthy into mossy soils. It is not by repeated transmissions of mossy particles, deposited by water or winds on the surface: these may accelerate the change; but it is principally the corrosive quality residing in the fluid which the moss incessantly emits, that eats out of the soil every vegetable root, and impregnates the pure earths with all the qualities of moss. Sand only resists the dissolvent influence of this distillation, and wherever sand is found mingled with moss, it is an indication that the soil owes its mossy qualities to a tract of moss lying in a higher district.

By the time these transmissions from the moss have wrought for themselves a passage between the two upper strata, the vegetable mould is deeply tinctured with their qualities. Its native grasses, however, do not immediately disappear, nor is there any apparent change in their leaf or root. They would not leave the soil at all, if it were not for the appearance of bent, which springs up immediately after the soil is impregnated with moss. The different varieties of this production, wherever they spread, suppress the milder grasses; while, on spaces to which they do not extend, the native herbage continues to flourish, exhibiting a deeper green, and a bolder growth, than formerly, when it sprung from a pure earthy soil.

It must not be understood here, as if these bents and grasses invariably grew in a promiscuous state among each other. In some situations they are found partially mingled; but in some cases they occupy distinct places, and although the outline of each space is vastly waved and irregular, yet it is generally perfectly distinct; and yet I never could observe any specific difference, either in the depth or solidity of the respective strata on which they grew. The surface, however, of those places which bear the fly-bent, in no long time swells up with the roots of this unsubstantial production, and becomes tufted with dead knolls. It is then good for nothing but lapwings and plovers to hatch their brood on in the summer months. The other kinds of bent do not deteriorate the soil so much. Their appearance indicates the existence of moss, and their continuance confirms its solidity and extension; but the soil which produces them remains firm and consistent. Stool-bent (Juncus and squarrosus) is the most valuable of all the kinds of bent. It has large white roots, and when these happen to rise out of the ground, when sheep are pulling away at the stalks and leaves, which spread on the surface, they are gathered and eaten with great avidity. I believe, indeed, that if they could be had in sufficient abundance, they would nourish in a manner little inferior to turnip. Stool-bent continues its verdure all the year round; and in spring, when all the finer grasses are destitute of taste and nourishment, it still offers a green, fresh, and juicy bite to the poor exhausted sheep, who are wearying and wandering about for verdure.

The last state in which we find moss, is when it covers or is slightly mingled with lea soil. Here it is always dry and powdery. In the former cases, we have found that stagnant water, and the remains of vegetable productions, are the principal agents both in the formation of moss, and in its annual increase, till it comes to a state of perfect ripeness. But, in the present case, a natural damp in the soil is wanting; and though the dwarfish heath annually sheds its lower leaves, yet, in the absence of constant wet, the two soils never coalesce thoroughly, and the moss continues in a dry layer over the earth, or only slightly mixed with it. This is the worst state which land can be in; it produces nothing but a thin scurfy deteriorated heath, and as it completely covers up the earthy soil, excluding both the genial gales and solar heat, it disqualifies it from exerting its vegetative powers in the production of other plants. On inspecting a field of this description, several tufts of the stool-bent will be discovered. These spring from spots where sheep or cattle have left manure. There is also observable a small weakly species of grass, which stands so thin on the soil, and has its stalks so small, that it cannot be collected into a bite by cattle, and it is carelessly gathered by sheep, as they can take up only one sprig of it at a time.

The three first states in which I have here said moss is found, have, for the most part, been formed above a soil originally sufficiently good, and the substratum is usually a reddish dense clay. This tincture it has probably received from the moss generating over it. In the fourth and last state, it has a gravelly subsoil, which freely allows the water to pass away; it is also invariably in such a situation, that all other damps, except rain from the clouds, are precluded access to it.

Finally, to sum up what has been said on this division of the Essay, in as few words as possible: Wherever wood, bent, or grass of any kind, go to waste, or fall down and are decomposed, their remains are changed into moss, if there be a sufficiency of damp to unite their decaying particles. As the crust of moss thickens, these annual depositions become more abundant; and the bed of moss, if forming on a declivity, is soon enabled to emit that juice which, as we have seen, contaminates the other soils with which it comes in contact. The least tendency to moss immediately sends up the benty grasses. Even on low pastures, remarkable for fertility, and the deepness of their verdure, I have often noticed *whorls* of the stool-bent; I have pulled it, and afterwards dug about the place where it grew, and never missed to find moss; often, indeed, very little—so little, that only the spot where the roots were inserted was slightly discoloured; but still it was moss, and had been sufficient to give existence to this coarse production. Where sprigs of the fly-bent or tufts of the stool-bent were found, it was always on spots which, owing to some distasteful quality in the sward, had been entirely neglected by the depasturing flock. The grass had run up into seed, and this, with the blades, falling down, had given a slight tinge of moss to the place where they stood.

The first and second states in which this substance is found, may be called primitive mosses, as they owe their origin and great accumulation to decayed timber, which had been felled to accelerate the military operations of the Romans. What the Romans began, the boisterous and stormy climate of Scotland completed; and hence the vast quantity of tree-leaves, fossil-wood, &c. which still compose a part of these immense beds of moss. Extensive tracts, thus formed, have an overpowering influence on other soils, which lie below their level, and in their neighbourhood. Where lower lying soils fully absorb their damp, their progress to ripeness is determined by the flat or sloping nature of their surface. Where the moisture exuding from the moss makes a subterraneous channel for itself, both the subsoil and upper stratum may continue unchanged for centuries. In the last state, where a feeble heath, and a few sprigs of bent, attempt to lay the foundation of moss, their influence is invariably unsuccessful; for without constant wet, moss will neither accumulate nor coalesce.

The above observations on the formation of moss, and on its produce, are all made with reference to an exceedingly high district.

Productions peculiar to Mossy Soil.

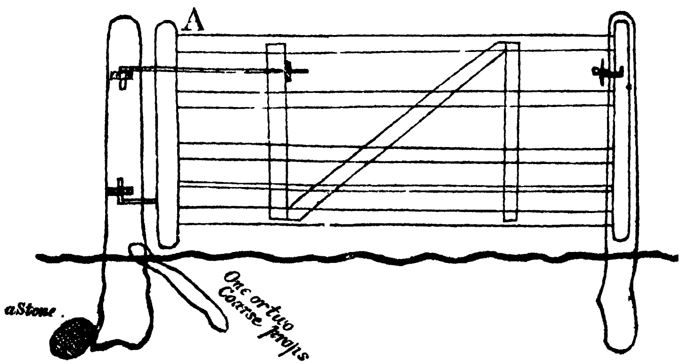
English Name.	*Linnean Name.*
1. *Heath*, with stalks of the plant which produces *crowberries*, and spreads much among heath.	1. Calluna vulgaris, Empetrum nigrum.
2. *Ling*, which prevails much in deep quick moss.	2. Erica Tetralix.
3. *Kinds of fog* peculiar to a dry, thin, mossy soil.	3. Lycopodium, clavatum, and alpinum.
4. *Stool-bent.*	4. Juncus squarrosus.
5. *Paddock-pipe.*	5. Equisetum palustre.
6. *Deer-hair.*	6. Scirpus cæspitosus.
7. *Yellow-grass*, supposed to raise the yellowlees among sheep.	7. Narthecium ossifragum.
8. *Fly-bent.*	8. Melica cœrulea, and Sesleria cœrulea.
9. *Wire-bent.*	9. Nardus stricta.
10. *Fog*, when it grows in tufts, the soil is often mossy under it.	10. Polytrichum commune.
11. *A production* very active in new moss, on a dry exposed situation.	11. Didymodon purpureum, and Funaria hygrometrica.

The author, in like manner, discusses the qualities and history of a wet and of a dry soil, into which two great classes he thinks that soils may be conveniently arranged. The following are the plants which he ascribes to a wet soil; the others were chiefly grasses in a state too imperfect for being determined.

Plants on a Wet Soil.

English Name.	*Linnean Name.*
1. *Rush.*	1. Juncus effusus.
2. *Soft meadow grass.* A bog properly drained produces it.	2. Holcus mollis.
3. *Risp.*	3. Carex cæspitosa.
4. *Spratt.*	4. Juncus acutiflorus.
5. *Pry.*	5. Carex cæspitosa, and panicea.
6. A plant which prevails much on undrained bogs. It is also found in bogs partially drained.	6. Scabiosa succisa.
7. *Fog* peculiar to undrained bog.	7. A group of marsh hypna.
8. *Fog* where the ground is very wet.	8. Trichostomum lanuginosum.

We take this opportunity of inserting a figure o Mr Hunter of Thurston's improved Field-gate, described b him to the Society, in 1825, as the diagonal bar was omitte in the Plate of last Number.—Edit.



COMMUNICATIONS ON STRAW-PLAIT.

[The attention of the Highland Society having been directed to the manufacture of straw plait in imitation of Leghorn, for bonnets and hats, as a means not only of encouraging the home manufacture of a commodity, for the purchase of which a large sum is annually sent abroad, but more particularly as affording employment to females in remote districts, and within their own houses, to an extent greatly beyond what, at first view, might be contemplated, several premiums were offered in 1825 and 1826, for the encouragement and extension of this manufacture. When it is recollected that in many, indeed in most of our Highland districts, and especially in the Hebrides, the population, which is by some alleged to have already increased to such a degree that the soil is no longer capable of affording subsistence to it, might be materially benefited by the introduction of this and other manufactures, so that many who are now obliged to seek an asylum in the colonies from wretchedness and contempt, might be enabled to remain in their native land, the subject in question cannot fail to be looked upon as of high interest. The plaiting of straw has hitherto been confined, in this country, chiefly to the Orkney Islands; but there are other islands on our coasts, the slovenly habits, and the general distress, of whose neglected inhabitants, might give way to activity, cleanliness and comfort, under a different system. It affords us great pleasure to see this improvement commenced in a retired corner, which has long been the seat of another species of industry;—we allude to the establishment of a straw-hat manufactory at Strontian, by Sir James Riddell. We trust the day is not far distant, which will see the rugged shores of the remotest Hebrides animated by the busy pursuits of industry and art. The information which the Society has to offer on the subject of straw-plait is not of so satisfactory a nature as could be wished, but it is yet deemed of sufficient importance to be communicated to the public. It will serve a twofold purpose,—in exciting the attention of some who may not hitherto have thought of the subject, and in eliciting fuller information respecting the processes that have been found most efficient in the manufacture in question. The communications received are:

1st, From Messrs J. and A. Muir, merchants in Greenock.
2dly, From Sir James Riddell, relative to the Strontian manufactory.
3dly, From Mrs Graham, Dumfriesshire.
4thly, From Mr Strang, Loanhead.]

I. COMMUNICATION FROM MESSRS J. AND A. MUIR OF GREENOCK.

Messrs J. and A. Muir of Greenock, in their communication to the Society on this subject, have furnished the following information.

In the summer of 1823, when their attention was first directed to the manufacture of straw-hats in imitation of Leghorn, they made hats from the common *rye-grass*, the *crested dog's-tail grass*, and the *sweet-scented vernal grass*; but none of these grasses, when made up into hats, had such an appearance as to encourage their persevering in the use of them. After numerous experiments with *wheat*, raised both from British and foreign seed, and which they did not find to succeed to their wishes, they were induced to confine themselves to the employment of *rye* (the stalk of the grain so called), as the most suitable straw for their purpose.

This kind of manufacture having been introduced into the Orkney Isles by a gentleman who went there on purpose from England, about thirty years ago, and having since formed a great source of employment to the females of these islands, Messrs Muir, in 1808, engaged an agent at Kirkwall to procure straw-plait for them. For a long time previous, this manufacture had been extensively engaged in by the poor in Bedfordshire. The material of which the hats are there made is wheat-straw, which is grown on the chalky soil of that county. Previous to being plaited, the straw is split into five, seven, or nine pieces, by means of machinery. The straw from which the plait was made in Orkney was procured from Bedfordshire, and the plait was sent to Greenock, where it was made into hats.

In 1809, they corresponded with a Mr Corston of London, who, in a memoir to the Society of Arts, stated the practicability of making hats in imitation of Leghorn from rye-straw; but owing to unacquaintance with the proper time for cutting it, and of the method of bleaching, they were not successful in any trials that they made.

In 1822, the Leghorn, or Italian hats, got so much into wear, and lessened so much the sale of split straw-hats, that they had thoughts of discharging all their plaiters. About this time, the Society for encouraging Arts and Sciences in London gave a premium to a lady in America, for producing a hat made in imitation of Leghorn, and called the attention of straw-hat makers in Britain to the subject, by offering premiums for the best imitation of foreign plait and hats. Messrs Muir, directing their attention to this new manufacture, tried every kind of straw they could think of as at all likely to answer the purpose, and, after numerous and diversified experiments, attended with much expence, were induced to decide in preference of rye. This being found to answer the purpose, they not only continued to give employment as before to the Orkney plaiters, but increased the number of them, appointed an agent at Stromness, a town sixteen miles distant from Kirkwall, and have of late placed another at Thurso, in Caithness.

Not being able to procure seed in Orkney, rye not attaining maturity there *, they send annually from Leith from 40 to 45 bolls, which are sown on about 12 English acres of sandy soil, manured with sea-weed. Several acres of heath for bleaching the straw, and water for steeping it, are required in the neighbourhood of the rye fields. The rye is cut when the seed is beginning to form, and it is necessary to attend to the precise time, for ten days too early or too late produce a considerable difference in the look of the straw. When the rye is cut, women are employed to tie it at the lower extremity in handfuls; it is then put into boxes, and covered with boiling water, in which it remains for half an hour. After this it is spread out upon the heath in a fan form, and turned twice daily, until the bleaching, which takes about ten days, is completed. If exposed to much rain while bleaching, the straw is injured in colour, and rendered very liable to take mildew. It is of great importance to have the crop well housed.

In addition to the above information, Messrs Muir have been at the trouble of procuring, from the import office in London, the following statement respecting the number of Leghorn hats imported into this country.

An Account of the Imports, Duty paid, and Stock of Hats for the Years 1826, 1827, 1828, *and* 1829.

Duty paid for Home Consumption.			Imported in each Year.						Stock on 5th July.	
Years.	Staw doz.	Chip doz.		Cases.	Tubs.	Pks.	Cks.	Bls.	Straw doz.	Chip doz.
1826	16,444	973	240	132	11	122	2	1	4,468	3,518
1827	20,697	1,319		470	6	142	35	3	4,067	[illegible],618
1828	22,724	535		500	2	267	2	1	7.434	3,820
to Feb. 16. 1829.	3,696	79		45		27			Feb. 14. 10.424	Feb. 14. 3,274 and 58 packages undistinguished.

Bill of Entry Office,
Custom House, 20th Feb. 1829 }

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* There can be little doubt, however, that the soil and climate of Orkney are perfectly capable of maturing the seeds of rye, for this grain suc-

From the above statement, it appears that there are imported to London alone, exclusive of those to Liverpool and Dublin, upwards of 20,000 dozen of hats annually, a quantity which, if made in this country, would give employment to more than 20,000 females, besides those already engaged in making the different kinds of straw hats.

II. ACCOUNT OF THE STRAW-HAT MANUFACTORY AT STRONTIAN.

This most useful establishment, which owes its origin to the praiseworthy exertions of Sir James Riddell, has now been in operation for nearly two years. The population of Strontian, from its extensive lead-mines, the great encouragement given by the proprietor to his tenants and crofters, as well as his eager desire to promote the happiness and domestic comfort of those around him, has been for several years rapidly increasing; and how to employ the younger members of the community, especially the females, had long been in contemplation by Sir James.

The favourable accounts of the straw-plait manufactories established in Orkney by Mr Muir of Greenock, led him to think that something of the same kind might succeed at Strontian; and accordingly, in summer 1826, the scheme was proposed, and a joint stock company formed. The Baronet and family, with most of the respectable individuals in the neighbourhood, became shareholders, and measures were

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ceeds sufficiently in the Outer Hebrides, the climate of which is probably more boisterous, as well as more variable, than that of the Orkney Islands. Mr Macgillivray mentions, that he has repeatedly eaten bread made of rye grown in the Island of Harris, and knows that it is in common use in the Island of North Uist. The rye of these islands, Mr Macgillivray adds, is supposed to have been introduced by the Norwegians, and to have kept its footing since the period of their domination. It is not, however, a favourite with the islanders, and indeed, in their way of preparing it, affords but a very disagreeable and coarse bread.—Edit.

thenceforth taken for carrying the plan into execution. To give it greater publicity, and the better to insure the sale of the articles manufactured, Mr Campbell of Greenock, Messrs Muir of the same place, and Messrs Calder and Company, Edinburgh (in whose possession specimens of the work are to be seen), also became proprietors. Mr and Mrs Johnstone, whose character, knowledge and capability of instructing in this department are well known, were recommended by Mr Muir as fit persons for undertaking the management of this concern. A comfortable house and garden were provided gratuitously by Sir James; and the necessary preparations being made, they commenced in May 1827 with about twenty girls. The scholars soon became more numerous, and in November 1828 they amounted to sixty, of which fifty were employed in plaiting, and the rest in preparing the straw, in knitting, or making up the plait into bonnets, hat-bodies, &c. The children are admitted when about seven years of age, but they seldom receive payment before ten or twelve months after; the first 10s. they make going for an apprentice-fee, and the next 10s. for clothing, with which they are furnished by the managers. As they are confined to certain branches, they soon attain to such proficiency in these, that a dexterous plaiter can earn from 5d. to 8d. a-day, and a good knitter from 8d. to 1s. They are also allowed to take to their houses materials for working, which, independent of the zest it must necessarily give to cleanliness at home, holds out a strong incentive to those who have a desire to be industrious.

Besides the Leghorn bonnets, a manufactory for gentlemen's hats has also been set a-going, which is carried on, in some respects, as a separate branch. This addition is exceedingly advantageous: it enables the pupils to become much sooner useful, the plaiting requisite for this purpose being of a coarser quality; and it also procures employment during the winter months, or other seasons when Leghorn bonnets are not in such demand. The hats are completely finished before they leave the manufactory, some being taught to sew the lining in the inside, others to put on the glue, and others to fasten the silk and braganza. These white and black hats are water-proof, cheap, light, and durable. A very superior one may be had for 9s. or 10s. and with ordinary care they have been known to last for two seasons.

The straw employed is that of *Secale cereale*, or common rye, though it is the opinion of the manager that some kinds of indigenous grasses might be discovered, which would answer the purpose equally well. For a short time after its commencement, the straw was sent from Greenock by Mr Muir, cultivated and prepared under his own inspection, but they now grow a sufficiency for their own use at Strontian. The seed of the rye is sown in April, in mossy ground, recently rendered arable, and if the season is at all favourable, it comes into flower in July, when it is cut down. The whole stem is then immersed in boiling water, in a trough made for the purpose, and remains in this state for two hours. When taken out, it is spread upon a grass field, and exposed to the sun, till it is properly bleached, which requires from two to four days, according to the weather. When bleached, the stalk is divided into separate parts, at each joint, and put up into bundles by the lengths. In this manner, the bundles lie in a proper place till wanted by the plaiters. This last process is done chiefly by old people, who are unable for the finer work, or by those pupils who have only lately joined the manufactory.

It is hardly necessary to say any thing in commendation of this and other similar establishments, as their great utility must be obvious to every one. At Strontian, the expectations of those who are more immediately concerned have already in some measure been realised, by the great change which the natives have undergone in their character and deportment—the cleanliness and neatness which has been produced, not only upon those employed, but also upon the general appearance of the whole neighbourhood. It could not be expected, however, that this work could go on in such a remote district without encountering obstacles, arising from various causes, but chiefly from the prejudices of the more ignorant of the people, who are accustomed to regard every innovation as useless, if not dangerous. These are now fast dying away, and several circumstances concur to draw their attachment to this manufacture. The Highland Society has given it their patronage, by awarding several premiums; and the money which the most industrious have been enabled to collect (one of the expert workers having purchased a cow for her father), affords the most substantial proof of its usefulness, calculated alike to root out the prejudices against it, and to excite the diligence and ardour of those who are engaged in it.

III. FROM MRS GRAHAM, DUMFRIESSHIRE.

THE next communication, which cannot fail to be interesting, as relating to the ingenious industry of an unaided individual, is extracted from a letter to Mr MACLEOD of Harris, by THOMAS CARLYLE, Esq. which accompanied a straw-hat presented by him to the Society for inspection.

Mrs GRAHAM, the maker of this hat (says Mr Carlyle), is a poor but industrious woman, about five-and-thirty years of age, resident with her husband and daughter, in a cottage belonging to a little farm called Myer, in the parish of Hoddam, Dumfriesshire. Her husband, who is a weaver, is, from the state of his health, unable to work much, so that, for a number of years, the charge of providing for the little household has fallen chiefly on his wife, who, although in poor health herself, has hitherto contrived to perform this task in a highly creditable manner. Her chief resource is the making of straw-hats, chiefly of the wheat-straw kind, for which, by reason of their cheapness, she finds a ready sale during the summer season, all over the neighbourhood. About four years ago she procured a look of Cobbett's *Cottage Economy*, from a farmer in that district, and finding there some instruction about the plaiting of Leghorn bonnets, immediately set about turning it to advantage. By means of Cobbett's figures and descriptions, she succeeded in discovering the proper sorts of grass in the fields, and then in bleaching, cleaning and plaiting it, as he prescribed. Farther trials gave her more insight, and in this branch of the business she was soon perfect. The sewing of the plait together cost her more trouble; but this also, by examining several pieces of real Leghorn, she at last accomplished to her satisfaction. The art of pressing, smoothing, and trimming the plait, was next learned, and, before long, various Leghorns of her manufacture were to be seen, in actual wear, in that quarter; indeed, as many as she could make were willingly bought by the shop-keepers of Dumfries.

In a letter accompanying the hat above mentioned, Mrs Graham states the following particulars relative to the mode in which the rye-straw, of which it was made, was prepared. "It was cut when in bloom, and bleached in the following manner:—After being cut, it was made up into small parcels. A tub being procured, as many of the parcels were put into it as it could conveniently hold. Boiling water was then poured in, till the whole of the straw was completely covered. When the water had acquired a sufficiently dark colour, the parcels were taken out and spread upon the ground, care being taken to turn them once every day, till the bleaching was completed. When the weather is unfavourable, the bleaching is attended with considerable risk, which I think may be estimated at the rate of about 50 per cent. on the whole. The best plan, I believe, is to secure the parcels of straw in sheds during the night. Straw bleached after this manner, will have a finer colour, and will be completely safe from mildew during the process."

IV. FROM MR STRANG OF LOANHEAD.

From a letter addressed to the Society by Mr David Strang, teacher of the Subscription School of the village of Loanhead, in which he states, that after numerous trials of various kinds of material for the manufacture of straw-hats, he was induced to give his decided preference to what he terms *Winle-straes*, and which appear to be the *Holcus lanatus* of botanists, or soft meadow-grass, of so common occurrence in all parts of the country, the following extract is presented :

In ordinary seasons, the winle-strae grass may be gathered in the beginning of the month of July. One easily discovers whether it is ripe enough, by pulling out the top piece from the first joint. If it is not so soft as to be readily crushed between the fingers, the grass may be concluded to be sufficiently ripe. It must be gathered while green, otherwise it will not bleach white, nor possess sufficient toughness. Though, in plaiting, nothing but the part from the seed to the first joint is used, in gathering the grass, it must be cut close to the ground, to prevent its shrinking in the bleaching.

When some bundles of it have been gathered, let them be tied, but not tightly, and laid in a tub, and let boiling water be poured upon them, till they are entirely covered. Let them remain in the water twenty minutes; then spread out the grass, very thin, upon a bleaching green, and turn it every day ; and, in the course of five days, in sunny weather, or a little longer in dull, it will be found to be perfectly bleached. In laying it up to preserve it, care must be taken to have it thoroughly dried, to prevent its colour and toughness from leaving it.

After the straw is bleached, the next thing to be done is to pick out what is useful for plaiting. This is easily done, by holding a straw in the one hand, applying the nail of the thumb to the first joint, and then pulling it smartly with the other hand.

The straws being thus picked, and put into separate bundles, according to their quality, let thirteen of them be taken and tied firmly together by the seed ends; attach them to any thing, such as the back of a chair, to keep them steady; then take hold of the loose end of the bundle, putting six straws into the one hand, and seven into the other. Take the outermost of the seven, and with it cross over two; then carry it behind the next two; and lastly, before the remaining two; after which lay the straw into the other parcel of six. The first parcel of six being now made seven, take the outermost straw of it, and carry it across the bundle, by two, as in the former case, laying at last this seventh straw into the other parcel as before. It will be understood by this that the outermost straw of each parcel is always made the acting straw, and that, in the progress of the operation, each of the straws of both parcels is thus employed in its turn.

As the work goes on, it will be necessary, now and then, to join in new straws. Seeing any one needing to be renewed, watch until it becomes the acting straw; and, when it is to be laid into the other parcel, after performing its round, lay it up over the piece of plait, instead of putting it into the parcel, as formerly, and in place of it, lay in a new straw, which is then to be used exactly as if it were the old one.

If by chance, in working, any of the straws should break, a thing which can scarcely happen with winle-straes, to any but the outermost straw, and to it only through want of attention, it may be remedied without any more trouble than putting in a new one in its place; and though the outside of the plait with the old and new straw should exhibit the appearance of a broken loop, yet, in the knitting up of the work, it can easily be so managed that the effect shall be entirely concealed.

The knitting need not be begun till as much of the plait is made as may be supposed sufficient to form a hat, as an entire hat, of any desired shape, may be made up of a single piece of plait. About seventy or eighty yards will be sufficient to make a lady's hat.

In joining in new straws, during the plaiting, the ends of the new and old having been kept on the upper side of the plait, this will therefore be made the inside of the hat. After twisting and turning the plait a little, to make it form the round piece for the top, the plait will be found to lie with the one side to the other, like the teeth of two saws turned to each other; and then so to unite these two opposite sides that they may present the appearance of one piece, begin to sew by putting the needle in through the sort of stitch or loop on the outside of the plait, inserting the needle from below. Take the stitch of the opposite piece in exactly the same way; and after four or five stitches of each side are taken on the thread, draw it up tightly, so that the stitches of both may be brought firmly the one beside the other. In this manner, in the course of the operation, it will soon be seen that the place where the seam is can scarcely be discovered from the rest of the plait.

To sew the crown of the hat so that it may be quite plain, every stitch of the one side must not be taken with every one of the other, but every second or third only of one of the sides, till the work get on a little.

The blocking of a hat may be done with any round piece of smooth stick that will fill it. After the hat is well steeped, and put on the block, it may be made quite smooth by beating it gently with a hammer.

FISH-PONDS.

[In France, Germany, and the Netherlands, fish-ponds are very common, and, in general, are carefully and skilfully managed. In some parts of England, too, they are objects of particular care, and the returns are great. Perhaps the most satisfactory information on the subject of fish-ponds in our language, is to be found in the second volume of the second series of the Repertory of Arts, &c. in a communication from Mr Richard Weston of Leicester, and in Dr Fleming's Philosophy of Zoology, vol. ii. p. 363. In Scotland, fish-ponds have been greatly neglected. It is doubtless true that the country abounds with natural lakes, and is almost every where intersected with friths, and that these contain fresh-water fish and sea-fish in plenty. These circumstances may have somewhat lessened the call for artificial ponds; but they ought not, by any means, to supersede them. In countries on the Continent, approaching in nature of surface and in climate to our own, such as Sweden, the rearing of fish has been duly attended to. It is a striking fact, that, towards the middle of the nineteenth century, Carp and Tench should still be wholly unknown in the Edinburgh market; yet even small and shallow ponds might be successfully stocked with these fishes, and become objects of profitable enterprize: for, in a climate such as ours, where evaporation has little influence, less depth of water is required than on the Continent. Carp and tench are very vivacious, and much more easily transported alive than char or trout. They agree well together; are hardy, and scarcely ever fail; and, care being taken to stock with both sexes, in the proportion of one male to three or four females, they multiply very fast. At all events, if these kinds of fish be not reared for the market, they ought to be more generally attended to by resident proprietors, on account of the great conveniency of having a dish of carp or tench constantly at command.

Carp (*Cyprinus Carpio*) is an exotic fish, and was introduced into England in the beginning of the sixteenth century, and into Scotland at a much later period. Tench (*Tinca vulgaris*) is a native of English lakes and rivers, but not of those of Scotland. We possess, however, some excellent pond-fish indigenous to our own waters; particularly several distinct *species* of Trout: such as the Lochleven speckled grey (Salo Eriox ?) the Lochleven silvery white—the Hirling or Whitling of other districts (S. albus ?); the Salmon-trout (S. Trutta); the Bull-trout (S. Hucho); the Burn-trout (S. Fario); with the common Char (S. Salvelinus). A large pond, from six to twelve or even twenty acres in extent, stocked with these, must form a valuable appendage to any domain. Such a sheet of water may often be rendered highly conducive to the ornament of the grounds, and is calculated to afford excellent sport to the angler. All that is wanted is a hollow piece of damp ground, with a feeder leading into it, free from any noxious mineral impregnation,—an embankment, and a sluice.

Perch (Perca fluviatilis) and Pike (Esox Lucius) are also native fishes, and should not be overlooked. If they be at all permitted in the trout pond, however, they ought not to be allowed to multiply greatly, nor to attain a large size; otherwise the destruction of the weaker kinds of fish is certain. A waste piece of water may be advantageously appropriated to them; and Eels (Anguilla vulgaris) might also be here encouraged. To stock a large pond with carp, tench, perch, pike, trout, and eels, promiscuously, is a practice not to be commended; incessant hostility results, each devouring the spawn and fry of the other.

The fishes above mentioned are those that deserve most attention in Scotland. Others of less economical value are not wanting. Though we do not possess the Dace, the Gudgeon, the Rud, and the Barbel of England, our Scottish lakes and rivers afford the Bream, the Chub, and the Roach or Braise; and we can boast of some fishes that are nearly peculiar to the country,—the Vendise of Lochmaben and the Gwiniad or Powan of Lochlomond.*

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* Some naturalists have considered these as being the same species of fish; but others regard them as distinct;—the Vendise as the Coregonus Ma-

Sea-water ponds are wholly unknown on the Continent; and we do not recollect to have seen or read of any attempt at the formation of such ponds in South Britain. In Scotland, however, we possess several, which are stocked chiefly with turbot, cod, haddock, whiting, thornback, coal-fish, and salmon.

In the year 1828, the Highland Society of Scotland, anxious to draw attention to the subject of Fish-ponds in general, offered a premium for an essay on the Formation and Management of such ponds, and which should describe the kinds of fish which may advantageously be cultivated together. Several communications were received, and a part of the premium was awarded for the essay which follows.]

ESSAY ON FISH PONDS.—*By* MR WILLIAM WHYTE, *Land-Surveyor, Mintlaw.*

I SHALL confine my remarks to the kinds of fish and ponds best suited to our northern climate and country; and I shall particularly allude to some ponds or artificial lakes formed, chiefly under my direction, between thirty and forty years ago, at Pitfour in Aberdeenshire, where fish of various sorts have been raised with considerable success. I regret, therefore, that my practical information must partake a good deal of a local character.

The first thing to be done, is to choose a convenient situa-

renula, and the Gwiniad as C. Lavaretus. It is a comman tradition that they were introduced into their respective lakes about the time of Queen Mary; but they are tender fishes, dying almost instantly on being taken from the water, so that to transport them to any distance would be extremely difficult, if not impracticable. In all probability, therefore, they are indigenous to the lakes which they now inhabit.—EDIT.

tion, a natural hollow, so that as little of the operations of art as possible may be required. If the pond or ponds be not made entirely for the profits derivable from them, but partly for beautifying the scenery, attention should be paid particularly to the situation, so that they may not be hid from the view of the house, as nothing has a more elegant appearance than sheets of water seen alternately, when approaching a gentleman's residence. The extent may next be considered, and this evidently depends on the quantity of fish proposed to be raised: the extent, however, must be, in a certain degree, regulated by the form of the place fixed on. It should never be less, if in one pond, than five or six acres; and, in many cases, four times this extent will be easily obtained. Ponds are to be formed by an embankment at the lowest part of the hollow; or perhaps two embankments may be necessary, if there are two off-lets for the water. Artificial excavations are very expensive, and never can be accomplished to any great extent.

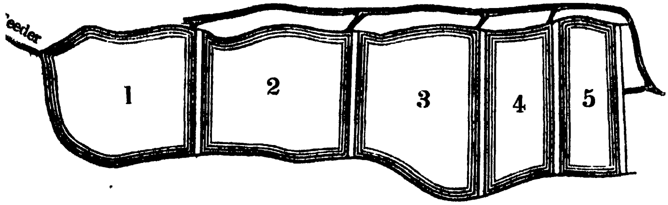
If possible, a marshy or wet place should be fixed on for a pond, as this kind of place will retain the water better than a dry sort of soil, and is generally fit for nothing else, or, at least, might not otherwise be so well employed.

The water in the pond should always be of the depth of about five or six feet at an average; if not of this depth, weeds and rushes will be apt to grow up and occasion considerable expence in keeping the pond clean. Cleaning should never be neglected: many of the fish would not thrive were this to be overlooked; and, in fact, by allowing mud to accumulate in the bottom, the fish would soon lose a considerable part of their water. In order that the ponds may, with as little difficulty and expence as possible be cleaned of weeds and mud, they must be so constructed that they may, at certain seasons, for this purpose be entirely emptied of water. This may be done in various ways: the easiest, however, and that which may be done at least expence, is to fix in the embankment at the lowest end, a wooden sluice, by which the water may be drawn off. Where it is desirable that the pond should appear as a continuous sheet of water, it may be found expedient, for the sake of cleaning, to raise in the middle, or at some convenient part, another embankment. This middle embankment is to be raised only to the height of about two feet *below* the general surface of the water in the pond when full, so that a pleasure boat, where such is kept, may pass over the embankment. By this contrivance, one-half of the pond is emptied at one time, and the fish are transferred from the one to the other in the time of cleaning.

The mud and stuff removed from the bottom will, in many cases, prove a rich manure, as the drainage water will have swept along with it a considerable quantity of the richest soil of the neighbouring grounds. This is the reason why ponds, into which a considerable quantity of surface water falls, are always the best adapted for feeding fish. Although there should in winter be more than a sufficient quantity of drainage water to keep up the water in the pond, a current of clear spring water should always be sought for, in case of severe droughts in summer. If there be a considerable current of water continually passing through the pond, it may not be improper to allow the fish to pass up the stream a certain distance, to shallow sandy places, for the purpose of spawning, particularly trout.

If ornament be not considered, but merely productiveness of fish, there should be formed a suite of ponds in a convenient place, situate between two rising grounds. To complete the series, there ought (as recommended by Mr Weston) to be five different ponds separated by embankments. Two may be appropriated for breeding, and these should be the uppermost. Clear and sharp water is found best for breeding, and soft and thick water for feeding. This points out the lower ponds for feeding. These ponds ought to vary considerably, with regard to their extent, according to the purpose to which each is to be appropriated.

A rough sketch will make this more plain: it is not, however, to be understood that I recommend the forms here given, but rather leave these to be modelled according to the shape of the ground, or the taste of the owner.



1 is a breeding pond, five feet deep at an average, containing about two acres, and intended for carp and tench.

2 is a breeding-pond, of the same dimensions as 1, but intended for perch and trout.

3 is a pond, intended for pike and eels, containing about two acres, and nine feet deep.

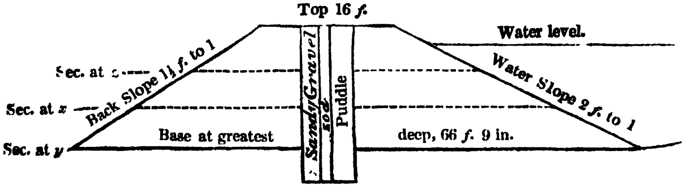
4 & 5 are two feeding-ponds, of about one acre each. Pike is not to be admitted into either of these, except they be young, and much smaller than the other kinds of fish.

In cleaning such a suite of ponds, a deep trench, extending along the side of them, may be dug, so that by fixing a wooden sluice in the bank of each of them, the water may be conducted from each separately into this ditch; and, by this means, any one of them may be dried at pleasure, without the necessity of disturbing the fish in the other ponds.

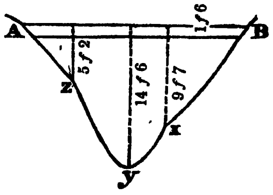
In forming the embankments, which may be considered the principal work and expence, great care must be paid to their construction, both with respect to strength, convenience, and beauty. No large embankment which can be made will be, of itself, altogether void of clumsiness; but this, in a great measure, may be obviated, by planting trees and bushes, and disposing of them with taste. This, however, should be done cautiously: they must not be planted so near to the bank, as that the roots of the trees should reach it, and render it pervious to water. It must also be observed that the leaves from trees are prejudicial to fish. If these be blown into the pond by the wind, they should as soon as possible be drawn off, and not allowed to float about and decay on the surface of the water.

The following sketch of the cross section and longitudinal section of an embankment will convey a distinct idea of its construction:

Cross Section.

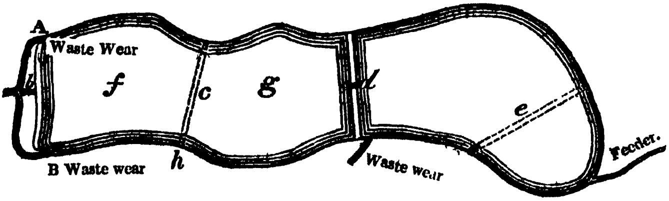


Longitudinal Section.



The puddling with clay, in the formation of embankments, should, above all things, be attended to, as much depends on the manner in which this operation is executed. Care should be taken that the workman begins his puddling at a sufficient depth below the natural level of the ground, say about three feet. In raising the embankment, the strength, as well as the quantity of puddle required, will depend on the depth of water and weight pressing against it, and on the nature of the soil.

Another rough sketch, with its explanation and description, will render what is said still more perspicuous.



A B represents the end embankment; the construction of which is shewn by the sections. The sluice is placed at *b*.

c represents an embankment, two feet under water, with a sluice fixed in the lowest place.

d an embankment, which separates the two ponds, with a sluice.

e represents an embankment, two feet under water, with a sluice.

The upper pond, marked *e*, is proposed for carp and tench, about six acres. The lower, marked *c*, for perch, trout and eels, also about six acres. When the ponds are emptied of water, for the purpose of cleaning, that part marked *f* is first emptied, and the fish put into that marked *g*. When *f* is cleaned, the fish and water are allowed to pass into *f* from *g*, which they will do by opening the sluice in *c*. If, after *g* is dried of water, there remain not a sufficient depth of water in *f* to preserve the fish alive, which will depend on the level of the ground, the feeder is to be changed, and the water let on at *h*. By this means, *g* can be kept entirely empty of water, by shutting the sluice in the embankment *c*, while there will be abundance in *f*. The same method may be adopted in drying the upper pond; and if there were two off-lets for the water, it would still be easier.

It is always proper to place two waste-wears, one at each end of the embankment, to allow the flood-water to escape. These waste-wears should be made on the solid ground, if possible, and not on the embankment; the size of them must depend on the size of the pond and the quantity of drainage-water. A channel of diversion has also been suggested, and employed to lead off the water before it enter the pond: but this can be accomplished only in particular situations. The waste-wears answer all the purposes of this last scheme, and, I think, are the best of the two.

It may be found of service to form, in convenient parts of the pond, small islands: these not only add beauty to the whole, but also, if swans be kept, are of essential utility to them, in affording suitable places for bringing forth their young. Some writers on this subject have said that any aquatic fowls should not be allowed on fish-ponds. Birds whose food is fish, as herons, certainly ought not to be admitted; but swans, I think, may, with little risk, be allowed: they certainly do more good in keeping down weeds, than they can do evil.

Small stew-ponds have frequently been made near the dwelling-house, or in the garden, in which the different kinds of fish are deposited when caught, until wanted for the table. They may be 12 feet by 24, and three in number.

Where one pond only is made, and it is desired that as many different kinds of fish as possible should breed and thrive, nature must be assisted, by making artificial bottoms; that is to say, one part of the bottom should be of one kind of soil, and another part of another kind of soil, as different species of fish prefer different bottoms. Trout prefer a gravelly bottom, and will not thrive well unless they have one. Carp and tench are not so dependent as trout on the bottom · a bottom containing weeds seems to suit them best.

It may here be remarked, that the upper or breeding pond should be the shallowest, and twice the size of the rest. This pond should also get a gravel bottom made near the edges, and in certain places be very ebb, so that the fish may deposit their spawn in these shallow places, and may there enjoy the genial heat of the sun's rays. The sun, it has been found, has a great influence in bringing forward and hatching the spawn, which shews us the necessity of making shallow places. There is nothing more common in summer than to see trout in rivers lying on shallow bars of sand, and sunning themselves. This pond, if possible, should not be deeper than about five feet at an average. The others may be deeper; and if pike are kept, they will require deep water. The feeding pond may be about nine or ten feet deep, the banks hollowed out, and having willow trees planted on the edges. One thing which should always be done, is to keep the bottom quite smooth, that, in drawing the pond, the net may not be entangled, nor broken. If the bottom is not smooth and even, great difficulty will be experienced in catching the fish, as the net will be apt to pass over them.

After the ponds are formed, they may be stocked with fish, taken by the net, from the nearest rivers, lochs, or ponds. If the fish are brought from a distance in casks, the water must be regularly changed, and always kept in motion, particularly in the case of trout, as they are very apt to die during their journey. The water should be changed every six hours at farthest. Great care is also necessary in catching these fish, that they be not bruised or hurt in taking them out of the net. Besides the common method of actually bringing the fish from other waters, an ingenious method has sometimes been adopted. This consists in procuring the ripe spawn, carrying it among water, mixed with grass, and placing it with all convenient speed in the shallower and sandy parts of the pond. This method was tried by the late Mr Ferguson of Pitfour, but it was never positively ascertained whether it was successful or not.

The fish which it is most desirable to keep, are, carp, tench, perch, trout, eel, and pike. I shall therefore mention a few things respecting each of these.

Carp are, perhaps, among the best fish which can be introduced into a pond; they breed often, and their young are also numerous, hardy, and grow very rapidly. The female, however, it is said, does not breed until she attain the age of about eight years; the male being mature at about five years. It is therefore proper, in stocking with carp, to take care that some of them be of full size, so as to insure a speedy increase in the pond. A proper proportion of males and females should also be selected. One of the former to three of the latter is considered a fit proportion. The late Mr Ferguson brought carp from England, and put them into a pond belonging to him at Bruxiehill, forty acres in extent. This piece of water was originally formed as a reservoir for the Buchan Canal; it was fed by no current of water, nor by springs, but was wholly kept up by rain-water. In 1827 it was drained, and a good many carp, both young and old, were found in it. This plainly evinces their fertility. Carp are common in the fish-ponds at Pitfour, and succeed perfectly well, although not so numerous as the other kinds.

Tench agree in almost every particular with carp: these two kinds of fishes may with entire safety be kept in the same pond; they neither attack one another, nor devour each other's spawn, as is the case with most other fish. Tench are to be found in great abundance in the ponds at Pitfour; as also in those at Fyvie Castle, Mormond House, Auchry, and in several other ponds in Aberdeenshire.

Perch are considered ravenous fish; they often devour their own spawn, and always that of other fishes, and, therefore, it is not desirable to keep them along with other kinds of fishes. In Pitfour ponds perch are to be found in abundance; here they live among carp, tench, trout, and eels. They are also to be found at Fyvie Castle in the same promiscuous company. The plan, however, is not to be commended. Those brought to Pitfour were got from the Loch of Slains, to which they are indigenous. The perch is a fish well known over all Scotland, and breeds and thrives wherever it is placed.

Trout are very common over all Scotland, and thrive and breed in great abundance, especially if the bottom be gravelly. Those kinds brought from Loch Leven (particularly the large speckled trout, and the silvery white trout) are thought the best. Trout as well as perch may be considered ravenous. I have often taken trout with their own spawn as a bait, and have seen the spawn in their stomach after being opened. The most advantageous method of keeping trout is, perhaps, along with perch and eels. At Pitfour ponds, common river trout, as well as Loch Leven trout, thrive and breed. Those brought from Loch Leven were put into a pond in which neither carp, tench, nor perch were: they have bred, and thrive. The extent of this pond is about eight acres.

Char were also tried in the ponds at Pitfour: they lived for some time, but now are not to be seen: it is supposed they never bred. Excellent char are to be found in Loch Le Near, and also in the Loch of Skene, about ten miles from Aberdeen.

Eels will thrive and breed in every place, and are to be found all over Scotland. They grow in ponds and lochs to a very large size.

Pike are indigenous as far north as the Water of Urie, near Inverurie, and the River Don at Aberdeen. The pike is considered by all as very ravenous, and ought never to be kept along with any other kinds of fish: like the perch, he devours not only the spawn of his own species, but also that of every other fish. The pike attacks the fry of all fishes, and all small and weak fishes. Indeed, he is so very ravenous, that he has been known to seize on young ducks, and devour them. A single pike has, however, sometimes been put into a pond, with a view to keep down the small fish when they were too numerous.

It may not, perhaps, be out of place here to mention some of the enemies to fish. Those which do most evil are otters, herons, divers, and sticklebacks or banstickles. The latter of these, although small and insignificant creatures, perhaps do more evil than all the others. These small fishes breed and thrive in every place, and to a vast extent. Even when the pond is nearly dried of water they will survive, the least quantity of water being sufficient to preserve them. The great evil done by these creatures consists in their devouring the spawn, which they always do as soon as it begins to be brought into life.

It is not necessary to say much as to feeding. Fish, when once put into ponds, with care and attention, need little support in the way of aliment beyond what the pond naturally affords. In severe frosts in winter, where the water is not very deep, it may be advisable frequently to break the ice, in order to allow air to reach the fish. Metal or wooden pipes have often been recommended for this purpose; they are to be placed on their ends, with one end above the water, and a lateral opening in the water, so that, although the surface of the water be frozen, air may enter by the pipes.

If the fish seem unhealthy, or appear to be in want of food, they may be assisted by throwing into the water earthworms, steeped grain, or ground malt, offals of poultry from the kitchen, and such insects as they are known to be particularly fond of. Besides these helps, Float-fescue, or Manna grass (Glyceria fluitans), has often been recommended. The flowers and seeds seem very acceptable to pond-fishes. It is advisable to allow some part of the margin of the pond to become covered with aquatic plants; for here vast quantities of animals of the genera Lacerta, Hirudo, Helix, Planaria, &c. will be produced, forming delectable morsels for the fish. In ponds for trout and pike, it is useful to introduce some kinds of small fish, such as minnow, par, and loche, these affording most palatable food to the larger fishes.

With regard to catching fish in ponds, undoubtedly the net is the best mode. The net may be made with meshes of about one inch and a quarter, so that the small fry may escape, and only those fit for the table be caught.

Eels may be taken by eel-cruives made of wicker-work; these have an opening at each end, and the eels are enticed to enter in by some garbage being hung in the middle; they find their way in, but cannot get out. In the end of the year they may very easily be caught by means of what is called an eel-ark, which is nothing but a wooden chest perforated with holes. This is placed at the off-let of the water, and when the eels endeavour to leave the pond, which they always do at a certain season, they fall into this trunk, and are unable to get out again. A plan similar to this is practised at the Loch of Forfar.

Carp are difficultly caught by means of the net. These fish are so alert, that, at the approach of the least danger, they instantly descend to the bottom of the pond, immerse their head among the mud, and by this means escape the net.

With respect to the value of the returns of ponds in Scotland, I am unable to give any decided report. Ponds in this country have never been carried to so great extent, or so carefully attended to, as in England. Their want has perhaps been less felt, on account of the many natural lochs, rivers, rivulets, arms of the sea, and friths, in Scotland, which are all naturally stocked with fish of various kinds. It is plain, however, that ponds may be constructed in Scotland, and fish raised in abundance; and this must be a very pleasant, as well as a satisfactory circumstance, to those who are desirous of producing within their own domains fish for their own tables.

Besides fresh-water ponds, Salt-water Ponds may also be constructed. They must of course be made in convenient places, where sea-water may at half-tide be introduced. The sea-water is to be introduced at half-tide by means of a wooden trunk, of sufficient dimensions, so that, as the tide rises, the pond may be full at high-water. The trunk requires grating. By this means there will always be 4 or 5 feet of water in this kind of pond at low-water, and 8 or 10 feet at high-water, the trunk regulating the depth of water in the pond as the tide rises or falls. The late James Ferguson, Esq. of Pitfour, constructed one at the mouth of the Ugie, where it joins the sea. In this pool salmon were kept. I must state, however, that when the salmon were kept in it for any considerable length of time, they grew languid, and not healthy. This might have been owing to the smallness of the pond, it being only about one-sixth of an acre in extent. The late Mr Arbuthnot likewise constructed some salt-water ponds at Peterhead; they were found very convenient for keeping sea-fish after being caught, until wanted for use. These ponds were so constructed, that at each tide the water was in a great measure changed. These Peterhead ponds, I am sorry to say, have been allowed to go into decay.*

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* Two other sea-water fish-ponds in Scotland deserve particular notice, as being, perhaps, the best in Great Britain. The one is at Valleyfield, the seat of Sir Robert Preston, Bart. on the shore of the Frith of Forth, near Culross; the other is at an inlet called Portnessock in Wigtonshire, on the estate of Andrew Macdowall, Esq. of Logan.

At Valleyfield an oblong square, of 220 feet by 188, is formed by walls or piers of masonry, in a hollow or slope on the margin of the frith, so that the outer wall is touched by ordinary flood-tides. In this wall are a sluice and grating, by means of which about two-thirds of the water can be let off and renewed at the time of stream-tides. A neat gravel walk is carried entirely around the pond, on the top of the walls or piers, and this walk commands a delightful view down the Frith. The depth of the pond varies from three feet, where shallowest, to eleven feet, where deepest; and, when of average fulness, it was found, by actual measurement, to contain 7344 tuns of water. The quantity of peat-moss thrown into the Forth at Kincardine, in the course of clearing away the great Blair-Drummond moss, sometimes proves detrimental to the fish, as the crumbling fragments float about in the eddies on the shore of the frith, and defile the water. The kinds of fish with which the pond is stocked are those found in different parts of the frith. They generally consist of the following—the scientific names here given being those adopted in Dr Fleming's excellent work entitled "British Animals:"—Turbot (*Pleuronectes maximus*); Bannock-fleuk or Brill (*P. rhombus*); Salmon-trout; Cod, and particularly the young, or *codling* (*Morhua vulgaris*); Thornback (*Raia clavata*), Grey Skate (*R. Batis*), and White Skate (*R. oxyrhinchus*); Plaise (*Platessa vulgaris*), and Flounder (*P. Flesus*); Sole (*Solea vulgaris*), found chiefly in Aberlady Bay; Smelt or Spirling (*Osmerus Eperlanus*); Herring (*Clupea

Harengus); and the Eel. Various other kinds of fish have occasionally been tried, but those now enumerated have proved the most useful. Some Perch were at one time put into the pond; but they soon died: although, therefore, this fish has been found to succeed in brackish water, it may be considered as an ascertained fact, that it will not prosper in sea-water. Lobsters and Crabs are also kept in Valleyfield pond; with a stock of Oysters and Mussels. Turtles from the Indies have often been stored in this pond for two or three months at a time, till the arrival of distinguished guests rendered the hospitable owner desirous to regale them with a turtle-feast. The food generally given to the fish consists of the cleanings of poultry from the kitchen, and the offals of sheep or lambs from the slaughter-house, the whole being cut into small pieces, and mixed with blood. They are very fond of shrimps and prawns, periwinkles, small mussels, and other shell-fish, broken in pieces. The fish do not, in general, improve in quality by being kept for any considerable length of time in the pond: it is chiefly useful, therefore, as a convenient reservoir of living fish, rendering the supply regular and independent of stormy weather. The cod-fish, and particularly the young cod, thrive well for a time. The flat fish, such as turbot, sole and plaise, with thornback and skate, also agree with confinement. The salmon-trout, the herring, and the smelt, are apt to fail; the latter often disappear altogether, being probably devoured by the larger kinds of fishes. The oysters, if put into the pond in autumn, improve rapidly, getting fat, and rich in flavour, during the winter months; but those left in the pond during summer generally die.—A handsome decorative cottage, including a dining-room and a complete kitchen, is built on the land-side of the pond. In this cottage, when the late Sir William Curtis visited the Frith of Forth in his splendid cutter, a fish dinner was served in such a style of perfection as called forth the highest praises of that most competent of judges in such matters. The company witnessed the dragging of the pond, selected the choicest specimens, and promenaded on the terrace around the pond till the fish were crimped and dressed.

Having so fully described the pond of Valleyfield, a shorter notice of that belonging to Macdowall of Logan may suffice; more particularly as this last has been already described at large, by Mr Neill, in the Scots Magazine for June 1816 (vol. lxxviii. p. 412.) The site of Logan pond had been an old quarry, close on the margin of the sea, and from which greywacke slate had been taken for building fence walls, or similar purposes. A narrow sinuous fissure, or perhaps a vein of softer matter in the rock, which had been washed out, nearly formed a communication between the basin of the quarry and the sea. Almost all that was necessary was to deepen this opening, and to place a grating upon it. At flood-tide the water covers, to the depth of two or three feet, a broad shelving ledge, which passes round an interior and deeper pool: at flood-tide, therefore, the fish have tolerably ample space, and at ebb-tide they retire to the interior pool, which is below the level of the entrance to the sea. The pond is replenished with fish caught in the mouth of Logan Bay, by the hand-line, those that are little injured by the hook being brought ashore in a tub of water. Young fish, or those of middle size, are preferred. Cod-fish, for example, of about four pounds weight, are considered desirable; but such as exceed six pounds, are never transferred to the pond. Haddock (*Morhua Æglefinus*) succeeds well; and, what would scarcely have been expected, this fish appears to be easily tamed, so as to approach and take limpets from the keeper's hand. The Coalfish (*Merlangus carbonarius*) prospers. and attains a large size, but becomes coarse in proportion to his bulk. Whiting (*M. vulgaris*), a most excellent fish for the table, has been successfully kept in this pond. The Pollack (*M. Pollachius*), generally called Lythe, has been found to answer well, and, in quality, is little inferior to the whiting. Ling (*Molva vulgaris*) has been occasionally tried. Salmon (*Salmo Salar*) have been kept for some months together in the pond, and have continued full of vigour and activity. The food given consists chiefly of sand-eels and shell-fish; and, in the herring season, herrings, cut into small pieces, afford excellent food for the larger fishes. Owing to the irregular shape of the bottom of the pond, a drag-net cannot be used; and the fish, when wanted for table, must therefore be taken with bait and hook. This is a disadvantage, as the best fish cannot always thus be procured when most wished for.—EDIT.

NOTES REGARDING SOME PLANTATIONS UPON THE ESTATE OF BALTHAYOCK, IN THE COUNTY OF PERTH. *By* ADAM FERGUSSON, *Esq. of Woodhill.*

THE attention bestowed upon woods and plantations in Scotland, within the last thirty years, is highly creditable to our landowners, and it is not perhaps altogether visionary to contemplate, ere another generation pass away, some revival of the ancient Sylva Caledonia upon our mountains and moors.

It is a circumstance, too, somewhat curious, and worthy of remark, that the precious species of the pine, so universally adopted, and so admirably adapted to our climate and soil, should itself be a native of the mountainous regions of that very Italy, whose soldiers committed such havoc in our woods. It is not, however, our present object to indulge in lengthened encomiums of planting, or to dilate upon the many good qualities of the Larix; we shall, therefore, proceed to the more immediate details we have in view.

The particular plantation to be now noticed, may be described as hilly, forming part of the western extremity of that range of high ground which separates Strathmore from the Carse of Gowrie, or valley of the Tay.

The soil is various, consisting in some parts of partially decomposed whinstone, in others of a sharp gravel, and of a coarse decomposing pudding-stone, with occasional portions of gritty clay and good loam. In general the soil may be termed dry. The plantation covers about 200 Scotch acres, which had borne a crop of Scotch fir from thirty to forty years old. At the period when the present plantation was resolved upon, the firs remaining on the ground were in a very unpromising state, and exhibited rather symptoms of decay, than of any further advancement. It was resolved, therefore, to make a clean sweep, and to replant, chiefly with larch and oak, ultimately contemplating the removal of the larch, and the establishment, as far as possible, of a permanent oak coppice.

The whole of this woodland, with about 150 acres more, was attached as pasture to an arable farm, open to be resumed by the proprietor, upon a deduction of rent, and was so laid off, that one line of fence would cut off the portion intended for planting, from what was still left as pasture to the farm. This fence was a turf wall, or facing of sods, four feet high, with a good *scarsement*, or foundation at bottom. It cost 2¼d. per yard, and a whin hedge was sown upon the top, which, by moderate attention, will soon become a formidable and economical fence. A piece of land adapted for a nursery was now chosen, where it was resolved, as far as possible, to raise the plants required. This spot contained two Scotch acres of good loam, forming a small haugh, or holme, to which was added a third acre, of a steep bank, facing the south, covered with wood, thorns, &c. the trenching of which formed employment to certain cottagers upon the estate, in the general stagnation of work, during the winter of 1819. The whole three acres were trenched with the spade, and have since yielded various productive crops, for the value of which credit has been taken in stating the expenditure, per abstract. They were, at the same time, planted with fruit trees, one acre alone being applied to the use of the nursery. The fruit-trees have succeeded remarkably well, and in a few years will form an early and productive orchard.

Such is a short outline of the preparations prior to 1822, when the planting commenced. It must be remarked, that some very untoward seasons have since occurred, and thousands of young plants have sunk under the droughts of 1825, 1826, and 1827. A regular and persevering system of *beating*, or filling up, has been steadily followed, and, without a strict adherence to which, labour and expense are in many cases totally thrown away. The soil of this plantation is sadly infested with whin and broom, more especially the latter; and no small expenditure, both of money and of patience, is required to overcome it. Whins are sufficiently annoying; but the rapid growth of the broom,—its great length and elasticity, choking, overshadowing, and, with every breeze, switching and shaking the plants, as yet imperfectly rooted,—renders it an enemy truly formidable to the planter. Much benefit has accrued from opening cuts, or small drains, in spots naturally marshy, or liable to retain surface moisture. The following is a correct statement of the numbers and kinds of trees planted, and of the whole expenses incurred, excepting the deduction of rent for loss of the pasture, which amounts to £66, 10s. per annum, a sum, by the way, *considerably exceeding the whole value put upon that, and* 150 *acres besides*, by the tenant when he took the farm, and illustrating the expediency of a special agreement, *before entering into a lease*, where any such transaction is contemplated.

A Statement of Plants and Expenses of Planting at Balthayock, from 1823 *to* 1828, *inclusive.*

Years.	Number and description of Plants, &c.	Market value.	Total outlay.
1822–23	1158 Yards of turf sunk fence, cost		£10 19 4
	6 lb. of whin seed to sow on top of do.		0 9 0
	20,000 Oak, worth, . . .	£20 0 0	
	130,000 Larch, . . .	19 0 0	
	24,000 Scotch Fir, . . .	2 0 0	
	5,000 Spruce, . . .	0 12 6	
	2,000 Beech, ...	1 10 0	
			43 2 6
	Expenses of planting the above,		28 13 2
1823–4	50,000 Larch, ...	£11 10 0	
	32,000 Oak, ...	32 0 0	
	7,000 Spruce, ...	0 17 6	
			44 7 6
	Expenses of planting this year,		29 18 4
1824–25	212,000 Larch, ...	£48 1 0	
	80,000 Scotch Fir, . . .	4 0 0	
	18,000 Oak, ...	19 4 0	
			71 5 0
	Expenses of planting this year,		37 1 7½
1825–26	230,000 Larch, . . .	£51 0 0	
	80,000 Scotch Fir, . .	5 10 0	
	2,000 Spruce, . . .	0 5 0	
	500 Ash, ...	0 10 0	
			57 5 0
	Expense of planting this year,		28 4 0
1826–27	14,000 Oak, . . .	£14 0 0	
	195,000 Larch, . . .	74 3 6	
	45,000 Scotch Fir, . .	4 10 0	
			92 13 6
	Expenses of planting this year,		27 14 2
1827–28	171,000 Larch, . . .	£76 19 0	
	23,700 Scotch Fir, . .	5 18 0	
	12,400 Spruce, . . .	5 12 0	
	600 Poplars, . . .	0 12 0	
			89 1 0
	Expenses of planting this year, This year was planting up what was destroyed by the drought.		23 3 4
	Expenses of cutting broom in plantations,		19 14 9
	Total expense, .		£603 12 2½
	1,354,200 Total number of plants.		

Abstract of Nursery Account.

Total market value of plants of all kinds, including some which were used at Woodhill,	£ 455	1	6
Net market value of stock, October 1st, 1828,	37	2	6
Total nursery outlay,	£ 492	4	0

Expenses and charges of all kinds, per books, from commencement, to 1st October 1828, including £5 per annum per acre, for rent,	£ 206	0	0

Value of plants reared,	£ 492	4	0
Deduct expenses and rent,	206	0	0
Clear profit,	£ 286	4	0

According to the nature of the soil, the allotment of plants has been 1000 oak, 1000 Scots fir or spruce, and 3000 larch, per Scotch acre, or 4000 larch, and 1000 Scots fir or spruce, with sometimes a small admixture of ash, beech and poplar. Five thousand plants of all sorts have been always allowed to each Scotch acre. These have been generally nursed two years, sometimes three, in lines from the seed-bed, and occasionally the most forward *seedling* larch have been at once transferred to the plantation. The loss from droughts may be taken at nearly 300,000 plants of all kinds *.

From the foregoing remarks, one or two practical inferences may be drawn:

1*st*, An idea very generally prevails, that where land has carried a crop of timber, it becomes *indispensable* to wait for the decay of the roots and stumps, before attempting to replant. So far as this, and some other instances in the writer's experience, warrant him in judging, he would strenuously deprecate such a waste of time.

Nothing can be more encouraging than his own experience upon this important point; and it is quite evident, that by prompt measures, a whole generation may be gained. He is not ignorant, however, that opposite opinions are entertained by some who have no wish to adduce such apologies for delaying to replace what they have cut down, but who consider the absolute decay of old roots and stumps to be requisite for securing health and vigour to their successors. Of course it must be understood that these remarks apply to the fir tribe alone.

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* The number of plants put out this season, up to February 1829, is 205,000, entirely for the purpose of filling up, and more still remains to be done.

This is a point of considerable interest, and well deserving to be maturely investigated; but the writer will venture to assert, that in every case minutely and scientifically examined, the failure may be traced to some uncongenial condition or quality of the soil—to something unpropitious in the season, or in the condition and constitution of the plants—and that no such delay is in general required to secure perfect success.

2dly, It is of the utmost importance, where the ground intended to be planted is likely to be occupied by whin or broom, that the planter should be quite prepared for obtaining the start, by *immediate* planting after the preceding crop of timber has been removed. In the present case, from not adverting to the delay occasioned by raising the plants at home, these noxious foes obtained an advantage which has required great extra expense to counteract.

3dly, It is impossible to overlook the economy and comfort of raising a supply of plants at home, where the forester understands that important branch of his art. By reference to the foregoing state, the large saving will be at once observed, and to which may very fairly be added, a considerable advantage, from having the supply always at hand, when the weather is propitious, with no small increase of constitutional vigour to the plants which are reared under circumstances so nearly approaching to their place of ultimate destination. It would seem to the writer, that professional nurserymen generally excel in the production of thick and regular seed-beds, and it has of late been his practice to purchase largely of seedlings, and nurse them for one or more seasons, as may be required, in his own ground.

In conclusion, the writer would respectfully suggest the importance of looking after the progress of those plantations which have been so well promoted by the Highland Society in various districts of Scotland. The planter who would succeed, should ever keep in view, that it is by no means sufficient merely to "*be aye stickin in.*" Thousands of acres and millions of trees, may be absolutely thrown away, without public benefit or private advantage, unless future care and attention shall be judiciously administered.

Reports, for which rewards should be given, might be appointed to be made at certain regular periods, upon the progress of plantations which had previously received Society Premiums, and accurate details in regard to the mode and expense of *pruning*, *profits of thinning*, &c. from time to time furnished. Such periodical accounts of the systems followed, could not fail, in various ways, to improve the management of our Scottish woodlands.

ACCOUNT OF EXPERIMENTS WITH KELP AS A MANURE.

I. *Experiments by Mr* Ker *of Kerfield in the year* 1828.

1. Two tons of small kelp, from Lord Dundas's store-houses in Orkney, were made use of. The kelp, of course, was not of the best quality. The experiments were made upon land near Peebles, and which is situated about 530 feet above the level of the sea.

2. The whole quantity was pounded into a powder, and the weight of a given measure was ascertained. The quantity to be distributed over an acre being of small bulk, and

the kelp having a tendency to affect the hands of the operator, an equal measure of fine sand, free from stones, was added to the kelp, and regularly mixed with it, for the sole purpose of facilitating the distribution of the kelp over the land. The operator distributed the kelp with his hand, and he was able to regulate the quantity per acre, with the same accuracy that a given measure of seed may be distributed over an acre.

3. Mr Ker found that the kelp decomposed slowly. He did not receive it until the month of March, so that he considers that, in his experiments, it was too late in being applied to produce the greatest effect upon the crop of 1828.

4. Upon a field of oats that had been sown and harrowed, he scattered kelp upon two ridges, at the rate of between 3 and 4 cwt. per Scots acre. On the one ridge, the kelp was left as it was scattered on the surface; on the other, it was slightly brushed into the soil. The adjoining ridges were manured with stable-dung, and the whole field, which was in oats, had been oats the preceding year. The two ridges that were kelped were fully equal, if not superior, to the ridges that were dunged. The ridge where the kelp was brushed in was superior to the other ridge; and in the course of Mr Ker's examinations through the summer, he observed that the kelp on the surface decomposed very gradually, and, in his opinion, it requires moisture to hasten the decomposition; and being dry in the early part of the summer, this process was retarded. The soil, in this instance, was a sandy loam.

5. He distributed, upon young clover and rye grass, a quantity of kelp, at the same rate per acre. Throughout the summer, it was very manifest that the ridges which were kelped were more luxuriant; and the farm-steward, who was desired to pay particular attention to the quantity when cut, was decidedly of opinion that the kelp portions had at least

60 stones an acre more hay. The second crop was also evidently more luxuriant than the rest.

6. Mr Ker scattered kelp at the same rate per acre upon a part of his lawn, which was old pasture grass, and which he intended to cut in hay in the year 1828. He selected a dry gravelly part of the field, where the grass at the time seemed worse than the rest of the field. The swath of hay was much heavier upon the kelped portion than upon the other portions immediately around which had not been kelped; and the after-math was remarkable for being full of white clover. It therefore produced an evident effect upon the pasture land.

7. He sowed about a similar quantity per acre upon a ridge of wheat, in the middle of a field. The soil was clay; and the increased quantity upon the kelped ridge was very conspicuous. So superior was this ridge to the rest of the field, that Mr Ker thinks there must have been some other cause operating that he was not aware of, which produced this remarkable increase.

8. A portion of the kelp was used in raising turnips. Mr Ker is satisfied that the experiment was not conducted according to his directions, for, on examining the drills, he found pieces of the kelp not sufficiently pounded, and he thinks the quantity applied was greatly beyond what was ordered. The effect was, that in the dry part of summer, whilst the other turnips in the field were growing vigorously, this portion seemed to be burnt up; and, upon examining it, it was obvious that too great a quantity of kelp had been used, and that, instead of being mixed with the soil, it had been put into the drill like other manure, and the seed sown upon the top of it; hence the acrid nature of the kelp in the dry weather was injurious to the young plants. Towards the close of autumn, after there had been a good deal of rain, the plants became a great deal more vigorous; and at the end of the season, when the other turnips were ripe, and their

leaves decayed, those upon the kelp were becoming vigorous. But they were pulled with the rest of the turnips in the field before they were ripe.

Mr Ker made a variety of other experiments upon different fields, and they all tended to confirm those particular experiments he has quoted. He thinks that 5 cwt. of kelp per Scots acre would produce a manifest improvement on any crop. He has had no experience yet, whether there is a corresponding increase the second or third year; but if it produces an increased quantity of straw and hay the first year, it of course increases the quantity of farm-manure.

Mr Ker is of opinion, from what he has observed, that it should be put upon the soil as early in spring as possible, and that it should be slightly covered with the soil, so as to keep it damp and within the influence of the air, the roots of the plants in this way more readily obtaining the benefit of it. In applying it to raise turnips, Mr Ker thinks it should be mixed with a portion of the soil in which the seed is to be sown, instead of being laid into the drill, and slightly covered with the earth, and the seed sown upon the top of it.

Mr Ker thinks, that in some situations and upon particular soils, a less quantity than four or five cwt. per Scots acre would produce a great effect, and he also thinks that an increased quantity would, in heavy soils, produce a more remarkable effect; but his object is to ascertain what quantity will produce a good crop, and the less the quantity, of course of the greater value is kelp. Mr Ker is directing a set of more extensive experiments this season (1829), upon a farm of Lord Dundas's in Clackmannanshire, the result of which will be afterwards communicated.

Mr Ker made also some experiments with the kelp in his garden. The crops were very fine; but it may be alleged, that as kelp contains a great deal of soda, its operations in the garden may have chiefly been in rendering the manure previously in the soil a food for the plants; and that no such effect would have resulted had there not been manure in the soil.

II. *Experiments by Mr* Macintosh *of Crossbasket, detailed in a Letter to Mr* Brown, *Hamilton.*

Glasgow, Dunchattan,
7th February 1829.

"Having uniformly remarked, that on those places where brushwood, furze, &c. had been burned in heaps on the ground, previous to tillage, the succeeding crop was always greatly ranker and stronger than the rest of the field, I concluded that this effect probably resulted from the alkaline matter formed or developed during combustion, acting upon the carbonaceous or ligneous matter remaining amongst the ashes, or entangled on the surface of the soil, rendering such soluble, and so from this operation alone becoming one of the most important parts of the vegetable kingdom. I consider this a more probable solution of the foregoing phenomenon, than either attributing it to the direct action of the free alkaline salt, or small portion of neutral salts, which the wood-ashes contain (although these may probably act as a stimulant, when applied in *minute quantity* to the fibrous roots of plants), or yet from the mechanical effect of merely burning or partially calcining the soil, upon which these heaps were formed and burned. Whatever the true theory is, the effect was so obvious, that without speculating farther upon it, I resolved to attempt imitating the foregoing process, by means of what I look upon as a corresponding medium, obtainable in any required quantity, viz. kelp, which contains ligneous matter in a carburetted state, free alkali, various neutral salts, and earthy matter.

"In order to give the thing a fair trial, I made choice of a field containing nine Scots acres in my farm in East Kilbride parish, situated about 250 feet above the level of the sea,—land which had been reduced almost to an inert state, by previous ill treatment and mismanagement. I had it thoroughly furrow-drained (the drains at 12 feet separate), and gave it a regular determined summer fallow, of six effectual ploughings and harrowings, then spreading nine chalders of lime on every acre, properly pointed in to the soil. Having brought it to this state, I divided it into eighteen equal portions, which I sowed with wheat last September, sowing and harrowing in with the seed at the same time, what I call portable manures, as follows:—

No. 1.	½ Acre with	8 cwt.	horn shavings or chips.
2.	½ ...	10 ...	ground kelp reduced to powder by a vertical mill-stone.
3.	½ ...	12½ ...	ground bones.
4.	½ ...	8 ...	horn shavings.
5.	½ ...	10 ...	ground kelp.
6.	½ ...	12½ ...	ground bones.
7.	½ ...	8 ...	horn shavings.
8.	½ ...	10 ...	ground kelp.
9.	½ ...	12½ ...	ground bones.
10.	½ ...	8 ...	horn shavings.
11.	½ ...	10 ...	ground kelp.
12.	½ ...	12½ ...	ground bones.
13.	½ ...	8 ...	horn shavings.
14.	½ ...	10 ...	ground kelp.
15.	½ ...	12½ ...	ground bones.
16.	½ ...	8 ...	horn shavings.
17.	½ ...	10 ...	ground kelp.
18.	½ ...	12½ ...	ground bones.
	9 Acres.	180 cwt.	or 9 Tons upon 9 Acres.

"If common stable or byre dung had been used, I could not have given less than 25 tons per acre on such worn-out land, which would have been to the whole field 225 tons instead of 9 tons! I pay L. 7, 10s. per ton for horn-shavings, and L. 4, 10s. for crushed bones. The kelp I used was Irish, and cost me L. 3, 15s. per ton—it contained 29 per cent. of earthy insoluble matter, the rest being chiefly neutral salts, and some uncombined free soda (about 4 per cent.)

"The above field is all, as nearly as possible, of the same quality, perfectly dry, and I believe there is not a weed in the whole of it. I got a favourable seed-time—it sprouted well, and for some space I saw little difference over all; but I was at last alarmed on perceiving the kelp lots having rather a more sickly yellowish hue, with many of the seed-leaves evidently much discoloured. Nevertheless, after a time, the whole assumed a healthy appearance; although I suspect some of the plants went fairly off; and before the late storm, which on my high grounds was pretty severe, I could discern hardly any difference over the whole field, although I consider the parts where the horn-shavings and clippings were applied, rather to be the best and strongest. Since the thaw, I have not seen it, but my grieve informs me, that none of my wheat is hurt.

"My own impression is, that I have applied by far too large a portion of kelp in the above experiment, which has acted as too powerful a stimulant—for on those spaces where it was emptied from the cart before spreading (which ought to have been done directly from the cart), not a single grain of seed had vegetated.

"Immediately adjoining to the above field, I have another of ten acres, potato wheat, also furrow-drained, having the same quantity of lime, and manured with about thirty tons of good stable dung per acre, besides which, I have this year two other fields of wheat, thoroughly drained and summer-fallowed, upon the foregoing plan, having the same quantity of lime, and manured with horn shavings, crushed bones, and woollen rags, in distinct lots (giving two tons woollen rags per acre, which cost me 50s. per ton.) I have also an additional field of potato wheat with dung; and if it will be in the least agreeable to you, I shall have pleasure in communicating to you the result of all my agricultural experiments, although I flatter myself you will take a look of them occasionally during the ensuing summer, and so judge for your-self. I have in all about thirty acres of wheat this year, almost all done with portable manures, where I believe a stalk of wheat never grew before I got the farm. I mean to try kelp both for potatoes and turnips next year, making the kelp into a compost with earth, to counteract its too stimulating effects. I am of opinion that 15 cwt. will be sufficient for an acre; at least I shall try this quantity."

Copy of a Letter from Mr BROWN, *Hamilton, to Mr* HUNTER, *W. S.*

"HAMILTON, *8th February* 1829.

"MY DEAR SIR,—According to my promise, I now send you a copy of Mr MacIntosh of Crossbasket's letter, as to his experimental trials of different kinds of manure. In November last, I had an opportunity of examining his fields of wheat, and nothing could look more promising. I drew his attention to those part of the ridges manured by kelp, where the kelp appeared to have been too thickly spread, as there the young wheat appeared less vigorous and thinner set than in other parts of these ridges. Where the kelp had been emptied in heaps, few or no plants had sprung up.

"I have no doubt of kelp proving a most valuable manure, particularly in districts distant from towns, where dung is not to be had to purchase; besides, the dung required for an acre costs much higher than kelp at L. 4 per ton, both on account of the original price of the former at 5s. per ton, or L. 7, 10s. per acre, and the expence of carriage of so bulky an article to the field from a distance. I dare say you are aware that a considerable trade has for a long period been carried on in Holland and the Netherlands in a species of ashes, which is principally made from burnt peat, and universally used as a manure, being carried to a great distance on the canals which intersect those countries. Our kelp is nothing else than a stronger kind of ashes, and likely to prove a far more valuable article for agricultural purposes than the Dutch ashes.

"Would it not be advisable to draw the attention of the Highland Society to this important matter, and get that patriotic body to give premiums, in order to bring the manure into general use with our farmers? I would also suggest, that a premium should be given for an experiment of burning a quantity of half-dried peat with sea-weed drift-ware, which I am convinced would be the means of greatly increasing the quantity, without deteriorating the quality, of kelp intended for manure.

"If such an experiment were to succeed, what a field would be opened to the poor Highlanders, on their peat-mosses and sea-shores, of useful employment at this manufacture, and what an additional stimulus would be given to our agriculture!—I am, my dear sir, yours very faithfully,

(Signed) Robert Brown."

ESSAY ON THE FLESH-FLY AND MAGGOT IN SHEEP. *By* Mr *William Hogg, Shepherd, Stobbs, Peeblesshire.*

Of all animals insects are the most numerous. When we look upon the earth, and observe the diversified forms which are presented by the vegetation that covers its surface, we might at first be led to consider the individuals of which the vegetable species are composed, as exceeding in number and variety all that the garniture of this planet offers to our observation; but a closer inspection soon convinces us of our error, and shews us that the animal creation is yet more numerous and varied. Each plant, each blade of grass, affords accommodation and nourishment to countless insects, different in their organisation, their tastes, and their enjoyments. To some the leaf becomes a suitable residence, and yields every thing necessary for their existence; to others the flower or the

haunch. It would probably leave them much nearer the anus, were it not that the parts in its immediate vicinity are within reach of the animal's tail, and that the sheep uses every endeavour, both with its tail and its feet, to rid itself of the irritation which the fly causes. We often, indeed, find the tail itself swarming with maggots, and discover that they have entered the rectum; but their presence in these places is always in consequence of the maggots themselves having spread under the wool, and not that the eggs have been originally left there. We also frequently find a perfectly healthy sheep attacked in these parts, the reason of which is this: A sheep is an animal that feeds to great excess, especially in the early part of summer, when the herbage is green and succulent. During the process of changing this matter into aliment, a good deal of air is engendered in the animal's bowels. This air is occasionally emitted, and carrying with it some particles which emit a peculiar smell, leaves them in part among the surrounding wool. Within the limits to which this smell extends, the fly finds a proper nidus for its eggs. In short, wherever any of the animal's juices have been left either upon its own wool, or its neighbour's, the odour emanating from them is a sufficient excitement for the fly to leave its eggs in the neighbourhood. Nothing is more dangerous than for the ewe-milker to lay hold of the wool with her wet hand, which she is often obliged to do, for the purpose of keeping the ewe steady above the pail.

Towards the beginning of August, when the increased heat has perfected a later swarm of flies, they attack sheep with greater fury. At this season, any part on which the fly alights appears to be fit for her purpose; and, in as far as can be observed, all places where its eggs are deposited, seem capable of vivifying the embryo.

It was on the 20th of April that I saw the first fly this season. On the 14th, the thermometer stood at 50°; on the 15th, 16th, and 17th, at 49°; and, on the 18th, 19th, and

20th, at 46°. The fly was very weak, allowing me to raise and turn it in my hand, without offering to escape. It was flitting about on the face of a sunny wall, but soon lost its hold, and, falling among some loose stones, disappeared.

Of the Developement of the Maggot, and the consequences which result from it.

The fly leaves its eggs in clusters of from five to fifteen, each heap at a little distance from the next. They may be about the twentieth or thirtieth of an inch in length, and in diameter not larger than a very fine hair. They are of a whitish colour singly, but some of the collections have a yellowish tint. On a dead carcass, they are generally deposited along the edges of the putrid mass; but, as soon as animation begins, they collect in hollows, where the putrefaction seems most rapidly advancing. In so far as I have observed, they become endowed with vitality sooner on living sheep than on a carcass. The time required for this change cannot be exactly ascertained in the former case, but in the latter it is about twenty-four hours. I am induced to think half that time sufficient in a living subject. Whether there be any acrid quality in the eggs, or they merely act as any other foreign stimulus, they have not been long in contact with the skin of a living sheep when they blister it. From the tumour thus occasioned, a thin serous humour soon flows, which no doubt greatly accelerates the vitality of the young maggots; and, from the poor tormented creatures, there now proceeds a peculiar smell, which, although not easily described, is well known to the shepherd. As the maggots rapidly increase in size and numbers, they soon spread over a larger space, and the discharge of serous matter becomes very copious, running in streams along the skin, and welling out among the wool. Millions of the small house-fly now feed on this humour, and penetrate into the spring whence it issues among the maggots. Mean time the large flesh-flies ply their work of generation with great keenness. But all this complicated annoyance is nothing like the distress and torment caused by the maggots themselves, which now spread in all directions, but chiefly following the streams of matter discharged from the blisters, and occasioning new blisters wherever they halt. In most cases, where the vitality of the maggots is first discernible, they there penetrate the skin, eat along the fleshy parts beneath, and soon enter by thousands into the interior of the animal, which instantly dies.

After death, the work of destruction still goes on. The fleshy parts are soon eaten away; the shattered sides of the carcass fall in, and disclose the most offensive sight, perhaps, which the eye can look upon: millions of maggots, all in one moving mass, weltering in slime, emitting a small hissing sound, probably from their dragging themselves through the doublings of one another, and through the ropy fluid in which they are involved. Thus they riot on until all is consumed, except the bones, the wool, and what was in the animal's stomach at the time of its death. While the wasting of the carcass was going on, an abundant quantity of putrid matter had dropped from it into the ground, and had copiously impregnated the soil to a considerable depth. The few of the maggots which remain, have now no other resource but to follow this distillation into the soil, and penetrate as far as they find particles of earth imbued with the putrid moisture *. If I mistake not, it is now that they enter into what is called the chrysalis state, and lie, wrapt in clammy

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* I say the few which remain, because great numbers are devoured by the carrion crow, the hooded-crow, and the raven. The kite and small hawk are fond of them, and very probably small wild quadrupeds, such as mice and moles, eat them also, so that few are allowed to retreat into the solid soil, in comparison with those which are thus prematurely devoured.

earth, in a torpid state through the winter. When vernal suns warm the earth, they approach the surface, and at last rise into the air winged insects *.

Discovery of Sheep attacked by the Flesh-Fly.

The timely discovery of a sheep attacked by flesh-flies is extremely difficult; and what renders it more so is, that the irritation caused by the house-flies, which constantly swarm in hundreds about the ears, belly, and, if it be a ewe suckling a lamb, about the teats, cannot be distinguished from that caused by the efforts of the flesh-fly to deposit its eggs in a proper place, though the indications of distress exhibited by sheep, as soon as the maggots become alive, are easily known. Another circumstance which prevents the immediate discovery of the maggoty sheep, is the great extent of pasture which mountain-sheep traverse. The average number of sheep in a hirsel may be estimated at 600. Some of the largest comprehend 1000, but 600 is about the mean proportion. These require a pasture of 1800 acres. But the extent over which these sheep wander at random is not the only disadvantage. Their range is, in part, made up of many places not easily seen, such as hollows, pits, scars, &c.; or its surface is often rough with cover, such as old heath, brushwood, and, above all, fern. Into all these obscure, and often inaccessible places, the tormented sheep wanders, trying if weight or pressure on the affected part can yield any relief. For this purpose it creeps under hanging braes, crags, &c. or into holes; but all in vain; the millions of insects increase every minute, and, in half a day, eat their way into the vitals of the creature, when it dies in excruciating agonies.

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* Although this may be the case with maggots, overtaken by cold weather at an advanced period of the season, it is by no means so with such as are developed during the warm weather in summer and autumn. These latter pass immediately into the chrysalis state, and, after remaining in it for some days, make their appearance in the state of perfect insects.—Ed.

Another circumstance which prevents the shepherd from instantly discovering a maggoty sheep, is the great disturbance and uneasiness which various species of insects give to his flocks in general on a warm summer day. For example, the small house-fly makes ceaseless attempts through the whole day to suck the humour that exudes from the corners of the eyes, or to feed on the waxy secretions which form in the inside of the ear; and the symptoms of uneasiness exhibited by sheep in consequence of these incessant attacks, are the same as those manifested when the large flesh-fly is in search of a place in which to deposit its eggs. The irritation caused by the first movements of the maggot is probably somewhat similar to that arising from these other causes. Each of these causes may occur singly, or they may all occur at the same time, and the indications common to all are, that the animal frequently jerks about its tail; lies hastily down close upon the earth, and rises as hastily; runs forward, then suddenly stops; holds its nose upon the ground, and stands still as if listening; and strikes its belly with its hind feet. These are common indications of anxiety; but no sooner are the young maggots animated, than they crawl about, and begin to excoriate the skin, when the animal exhibits symptoms of still greater distress. These are the following: The sheep is often found by itself, and appears lank and bellyless; if not among, it is at least frequently in, the vicinity of ferns, hags, rocks, or any kind of cover, under which it can occasionally conceal itself: the wool in some places is of a dirty appearance, and this colour descends in straight lines downwards; on the spot where the swarm is fixed, the wool frequently appears as if loosened from the skin, which it really is; the distressed animal often turns its head about, and attempts to nibble with its teeth among the wool, as if to allay some irritation. All these are undoubted indications of the vitality and activity of a swarm of maggots.

Method of destroying the Maggots.

To prevent the flesh-fly from attacking sheep seems to be impossible. All that can be done, therefore, is to rescue the animal when attacked. The writer of this essay does not place entire confidence in any recipe whatever; and this, not from a conviction that none sufficiently destructive has yet been discovered, but from circumstances often occurring in the case, which render the most powerful prescriptions unavailing.

The finding of a sheep again, after some remedy has been applied for the destruction of the maggots, which are fast eating it alive, is so uncertain, that it ought never to be dismissed until the shepherd is sure that he has rid it entirely of the devouring swarm. This he can only do with his hands and wool-shears. With these he removes the wool from the parts on which the swarm has fixed, until he can completely see the extent of the evil. This he cannot so certainly do by searching among the wool at random, and pouring in his mixture here and there. There is, besides, another circumstance in the case to which I wish the inexperienced reader to attend, as it shews the inutility of almost any prescription. The maggots generally enter through the skin by one or two principal apertures; but they no sooner find themselves in the soft fleshy parts of the animal's body, than they rapidly eat narrow passages under the skin in almost every direction. These small passages are as full of maggots as they can hold, all being in constant motion forward, as the foremost opens up a way; and it is no uncommon case to find, that they have penetrated more than a finger's length under the skin, in three or four directions, previous to their falling in upon the bowels.

Now, it is easy to see that the skin must cover and protect the maggots which have entered from the power of the composition, be what it may, the more especially as it falls loose and flabby over the hindmost ranks. Besides, I think that any mixture of a corrosive quality (and such are best adapted for the destruction of insects) poured into the warm flesh of a living sheep, would as likely destroy the animal itself as the maggots.

But it will be said, let the wool be clipped away only in cases of extreme necessity, and where the skin is perforated. To this I answer, before the shepherd can ascertain whether the skin is perforated, by searching at random among the wool, the disturbance which he causes to the swarm, disperses great part of them over the animal's whole body, when their immediate extermination becomes very difficult, indeed almost impossible.

Seeing, therefore, the hinderances which lie in the way of any composition having a full effect, I cannot but prefer cleaning with the hand as the surest and safest method that can be resorted to *, for all sheep wandering over a wide extent of pasture, and which, if but partially relieved, are, for the most part, never seen again, till their bones and wool, discovered in a thick bush of fern, or in the bottom of a dell, remind the shepherd that they are the remains of a sheep which he thought he had cleaned on such a day. To give particular directions to a shepherd with respect to this operation, would probably be superfluous. I shall only say, let him do it leisurely, carefully and completely, suffering none of the insects to escape. Let him clip the wool from the parts affected as close as possible, and if he can foment the excoriated places with any unguent that will suppress or diminish the smell, so much the better. I

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* It is necessary here to observe, that a sheep upon which maggots have once bred, is afterwards more liable to be attacked. The smell proceeding from the animal's body by the maggots, during the time of perforating the skin, with the effluvium emanating from the maggots themselves, continue about the sheep for many days, even although it should be perfectly clear of maggots.

know that good tar answers very well both for keeping down the smell, and for healing the ulcerated parts; but whether it is absolutely preferable to any other unguent I cannot say. Some persons of as great experience recommend train oil. If tar be applied, let not too much be daubed on, as it disfigures the animal, and a very thin covering will answer the purpose. But the shepherd will frequently find, that the maggots have broken the skin, and entered within it. If they have penetrated into the cavities of the abdomen, he may give up his efforts, for the maggots immediately disperse among the intestines; but if they be only working their way among the fleshy parts, he must clean all the narrow defiles into which they have entered with his finger. If the passage which they are eating out be too narrow for his fingers, or longer than he can trace to the end of, let him drop in some pieces of good clean tar, laying the sheep in such a position, that when the tar melts, it may run to the bottom of the perforation, which is sure to be crammed with maggots. When the heat of the animal has run the tar about the maggots, they will hasten out as fast as possible; indeed, they have hardly strength to come out, so deleterious an effect has the tar upon them.

In conclusion, I may observe, that tar is probably as effectual for the destruction of maggots as any composition whatever, while, at the same time, it causes no injury whatever to the sheep. But its tenacious and adhesive quality prevents it from being useful or much employed in such cases as those which we have just been considering; for before the heat of the animal can melt the tar, so as to make it flow over the maggots, they have frequently caught the alarm, and escaped to a clean part of the sheep's body.

In small parcels of improved breeds, occupying inclosed fields, or low-lying hills, where the range is limited, and where every individual sheep comes under the shepherd's eye once a-day, if not oftener, the following substances may be tried with tolerable assurance of success; they have already been employed on mountain sheep, and proved immediately destructive of maggots; but the cases were for the most part easy, and the maggots in such a situation as directly exposed them to the action of the mixtures.

On the farm where I reside at present, the sheep were much disturbed with maggots in the summers of 1826 and 1827. As the evil was new to us, we knew of nothing to use against it excepting tar, which we heard had been employed for the purpose from time immemorial. When we succeeded in getting the maggots involved among the tar, it destroyed them instantaneously; but tar is of such an adhesive quality, that when the maggots were discovered, it was slow in overtaking them. We had, however, some tobacco juice, and also some spirit of turpentine. Into a chopin of the tobacco juice we put a gill of the turpentine, and, on first using it, found the mixture effectual. It stood many days among the hills in bottles at our sheepfolds, and whenever we employed it, we found that it almost instantly destroyed the maggots. I have therefore no hesitation in saying, that this mixture is sufficiently good for the purpose. But a solution of the corrosive sublimate of mercury is what is commonly used. It is prepared by putting an ounce of the sublimate into three Scotch pints of water. The solution is then put into bottles, for the purpose of being carried to the folds, where the sheep are sorted. This preparation is in general use in the district. In what proportion it is distributed among the maggoty sheep it is impossible to determine, as some require ten times as much as others; but supposing the cases to be moderate, or rather slight, I believe an ounce of the sublimate, which costs 8d. will furnish a quantity of solution sufficient for sixty sheep. This is little more than half a farthing per sheep. I apprehend, however, that, in general, each sheep will require rather more than a farthing's worth. This solution does not sensibly affect the wool, nor does it injure the animal, provided the skin is not broken, nor the flesh deeply perforated.

As the preparation of tobacco-juice and spirit of turpentine was never used, as far as I know, by any but ourselves, I shall forbear calculating its cost per sheep. A chopin of the former and a gill of the latter were found sufficient for from seven to ten sheep: the method of using both mixtures is by gently opening the wool above the maggots, and pouring the liquid among them.

I have no doubt that either of the above recipes will be found successful, and may, with propriety, be used in small parcels of sheep which occupy parks and pleasure grounds, where it is of importance to avoid cutting blanks in the wool: they might also be with safety used wherever the range is limited, and the stock not numerous, and where a sheep is no sooner affected than it is seen and sorted every day, if not two or three times a day, till the evil be completely removed. But in all extensive pastures, or even in such as, though limited, abound in cover, the surest method is to clean the animal with the hand. In such situations, I would prefer an unguent that would prevent the fly from returning and replacing its eggs on the already sore part, to the most approved recipe whose effect should be confined to the destruction of the maggots alone.

Although formerly noticed, it is necessary again to observe, that the smell which proceeds from the parts blistered by the eggs, even when the latter have been removed, is sure to attract the fly in greater numbers than ever, if the place be not rubbed with some liquid to prevent it.

Cause of the prevalence of the Flesh-Fly.

When the flesh-fly meets with suitable substances on which to deposit its eggs, it multiplies very rapidly; yet, when the act of propagation is once over, it immediately perishes, and it is only in the chrysalis state that it survives the winter. As their habits, and the places where they are preserved through this season, are but imperfectly known, it is not yet ascertained why they prevail more in one season than another. I have sometimes apprehended that a sufficient reason for their prevalence might be found in the soft and greasy mixture, now employed for salving our flocks at Martinmas, instead of the old composition, whose principal ingredient was tar, and whose smell was directly repulsive to all the insect tribes; but almost every inference that can be drawn from actual observation opposes this theory.

There is one cause which, in some seasons, accounts for the prevalence of maggots in particular districts, and this is,—that sheep sometimes die, and are totally consumed by maggots, in situations where no animal can have access to them, for the purpose of devouring them. This often occurs in wide mossy pastures, especially in the spring. In deep unfrequented mosses, carcasses of sheep are frequently found, three, four, or even six feet below the surface, sunk in mud, and all in a moving heap of maggots. Into this foul recess, no creature, excepting the flesh-fly, can enter; and here, till the whole carcass is wasted, one swarm after another is perfected without disturbance. As they attain the perfect state, they mount into the air in successive colonies, and immediately disperse themselves in search of other carcasses on which to deposit their eggs. Now, when we consider the extraordinary fecundity of the fly, and the immense numbers that may be raised from a single carcass, it is far from being presumptuous to conclude that two or three carcasses, consumed in this manner, may sensibly augment the number of flies over a whole district for a season, when the weather happens to be favourable to the production of insect life.

Of the changes which the Maggot undergoes.

I shall now give a brief history of the metamorphoses which the flesh-maggot undergoes, until it reaches its perfect state.

About the end of June, I enclosed some pieces of putrid flesh in an earthen jar, to which I knew the flesh-fly would have access. I did not get it inspected until two or three days after, but when I did, I found that the fly had deposited several heaps of eggs in a regular manner. Next morning they were animated and crawling about, and had collected in the hollows of the flesh where putrefaction was farthest advanced. In a day more, they had attained their full strength and activity. Eight days after, I observed them quite torpid. At this time, they were obtuse at both ends. I was unable to examine them for two or three days more, and was rather astonished to find that the first swarm had then entered the chrysalis state. They were uppermost in the jar, and putting them aside, I found smaller swarms, which I judged to be later hatched, together with various heaps of ova. The chrysalis is shorter than the maggot, of a reddish-yellow colour, with several stout bands round its waist. When unagitated, it is entirely motionless; but when gently stirred, it moves in a small degree. About eight days after, I examined them again. I then found that most of the flies had emerged from their slough, and entered their perfect state. Several, however, crawled about upon the edges of the jar, which they immediately left, and crowded upon my hand. Many of them were whitish on the back, neck, and head. The empty sloughs still retained their yellow colour. They were dry, and possessed considerable tenacity. Thus, in about three weeks, the insect had gone through its various changes: the weather, however, was warm, and the place where the jar was placed was also warm, and free of any humidity. I therefore apprehend that this uninterrupted heat and dryness might accelerate the various transformations; for, where the insect is perfected by a regular process of nature, unaided by any exciting cause, I have known both the maggot and the chrysalis continue longer in their respective conditions, though I neither knew the time when they entered, nor that when they left it.

Concluding Remarks.

Finally, as the cuticle of the maggot is very tender, any preparation of mercury will probably be found sufficient for its destruction, and the recipes already mentioned may be depended upon. But the early discovery of a maggoty sheep, and the finding it afterwards in proper time for subsequent examination, are the most important parts of a shepherd's duty. Where the pasture is limited, and free of cover, it may not be difficult to discover the sheep and apply the remedy *before the evil is far advanced*; but where pastures are wide, high, and misty, or rough with heath or fern, cases will frequently occur where the attack has been carried on for some time; and to pour any preparation whatever, that in its action has a tendency to destroy animal life, into those narrow passages which the maggots have eaten in the fleshy parts, would, I should think, prove as destructive to the sheep as to the maggots. In these cases, a cleaning with the hand is both safest and surest.

Besides the specimens transmitted with this Essay*, for the inspection of the Society, there is another species of flesh-fly which I have not been able to procure this season. It is not, however, so common on mountainous pastures. It is smaller, and its abdomen is of a bright shining green. It is said to make its attacks fully earlier than the large fly: the mode of attack, the subjects on which it deposits its eggs, and the various metamorphoses of the latter, are, in all respects, the same as those above described. This variety is frequently to be seen on the remains of small dead quadrupeds, such as moles, mice, &c. and sometimes on dead reptiles.

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* These specimens here alluded to belonged to the *Musca carnaria* of naturalists, the Common Flesh-fly.

4th October 1828.

REPORT UPON DAIRY MANAGEMENT, MORE ESPECIALLY AS RELATES TO THE PRODUCTION OF CHEESE AND BUTTER.

THE importance of dairy husbandry, as a branch of rural economy, will be readily admitted; and, while so large a portion of Scotland, in respect of climate and soil, is well calculated for its adoption, we have to regret that a knowledge of its details has been hitherto confined, in a great measure, to a few counties and districts.

Dairy farming possesses *advantages in some degree peculiar* to itself. The humble owner of a few cows, may vie with the owner of a numerous herd; while the small arable farmer necessarily labours at a greater comparative expense than the man who, by a large capital and well organized system, cultivates some hundreds of acres.

The improvement of Scottish dairies, and dairy produce, could not escape the attention of the Highland Society; and the subject has, in a more particular manner, engaged its attention for some years past.

CHEESE.

In 1823–4, premiums, open to all Scotland, were offered for the best specimens of Dunlop (or mild Ayrshire), and imitations of double Gloucester cheese. Twenty-one competitors appeared, and a great number of cheeses were submitted to inspection. The competition took place in Edinburgh, on the 22d December 1824, the Committee having been favoured with the aid of several gentlemen of long and extensive practice in the cheese trade. The whole cheeses were of good quality; and the Committee report, that "they have the opinion and authority of the skilful professional individuals who were so obliging as afford the Committee their assistance, to say, that, while all the cheeses made after Dunlop receipts are excellent, twelve of those, in imitation of double Gloucester, which were selected for final competition, are equal, in quality and flavour, to the general run of real Gloucester cheese *."

Mr John Dunlop, one of the successful competitors, favoured the Society with a suggestion for an annual public sale of cheese, in dairy districts, which is worthy of consideration. He also animadverts, very judiciously, upon farmers bestowing their attention more upon the *weight* of cheese made, than its *good quality*, for the market.

In the following year, imitations of double Gloucester and North Wiltshire, were selected as objects of competition. This competition was likewise open to all Scotland. The competition took place in Edinburgh, on the 5th January 1826, the Committee having been again assisted by various individuals largely engaged in the butter and cheese trade, upon whose authority, with their own judgment, they had much satisfaction in reporting that the quality of the whole was truly excellent. On a careful comparison of the cheeses produced, some genuine Gloucester and North Wiltshire, the judges distinctly state, that "the quality of the Prize Imitation Double Gloucester is fully equal to the real cheeses of that variety, and would compete with them in any market. The imitation North Wiltshire also, is little inferior to the real; but the cheeses of this sort, made in form of pines, are not quite accurate in form, which may be attributed to a bad shape of the net, and they recommend to competitors to procure patterns of nets from England *."

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* The first premium for Dunlop was awarded to Mr William Sanderson, Black Castle, Lanarkshire; and the first for double Gloucester, to Mr Bell, of Woodhouselees, Dumfries-shire, whose excellent receipt has been since given to the public, in No. II. of the Journal and Transactions. Mrs Clouston, spouse of the Reverend William Clouston, minister of Stromness, Orkney, also sent up some excellent imitation of Gloucestershire, and which the Committee considered worthy of an extra premium, as a specimen of what even the *Ultima Thule* may produce. The three next best in the Dunlop class, were Mr Denniston of Cambuserskine; Mr John Dunlop, Auchans, and Mr Charles Dunlop, of Whitmuirhall. The three next to Mr Bell in the double Gloucester, were Mr William Sanderson, Black Castle; Mr James French, Burnhouse, and Mr Andrew Nicol, Easterhouse, all in the parish of Carnwath, Lanarkshire. The judges farther intimated their opinion, that the Dunlop cheeses of Mr James Patrick, Mr John Carmichael, Mr John Finlay, and Mr William Murray; and the Gloucesters, belonging to Mrs Clouston, Orkney, Mr George Hamilton, Mr Robert French, Mr John Dunlop, and Mr William Murray, were all *superior* specimens of the class of cheeses in which they were sent to compete.

Mr Sanderson, who has been much distinguished for the production of cheese, very obligingly transmitted to the Society a statement of the method adopted by him, which is worthy of notice, and from which, it will be remarked, that *shape and size alone* would seem to constitute the distinction between double Gloucester and North Wilts.

Method of making Cheese upon the Farm of Blackcastle, communicated by Mr WILLIAM SANDERSON.

"Not having a sufficient number of cows for making a cheese at one milking, the evening milk, after being skimmed in the morning, and heated to about 104° Fahrenheit, is mixed with the morning milk hot from the cows, and the cream which had been taken off the evening milk, also added, the heat of the whole being then 98°. The runnet and colouring are next added, the time of *coming* being from three quarters of an hour to an hour. When sufficiently firm, the curd is gently broke with a scoop, and left for a few minutes to subside; the whey is then taken off and the curd cut in all directions with a knife. When quite freed from the whey, the curd is cut into square pieces, and put into a drainer, with a cover to fit into the inside. This cover is placed upon the curd, and a 14 lb. weight put on it. Every half hour it is cut into small pieces, and some additional weight put on. This operation is continued for three hours, when the curd is put into a tub, and cut into very minute pieces with a knife for the purpose, in shape like the letter S. At this time the salt is added. The curd is next put into the cheeser or mould, a pretty heavy weight put on it, placed near the fire, and then put into the screw-press. The cows are milked about nine, and the cheese put to press about six; and, while it remains there, a little fine salt is rubbed upon it every time it is turned. The cheeseling (soft cheese), when finally removed from the press, is again rubbed over with salt, which is repeated for ten successive days, during which it ought not to be exposed to much drought. It is next rubbed over with a little fresh butter, and placed in the store-room, where it is turned three times a-week, and rubbed with a coarse towel. The salting is a great preventive from swelling. No cheese at Blackcastle has swelled this season, while swelling has been very prevalent in neighbouring dairies.

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* The result of this competition left the judges so much in doubt, that they recommended the premiums for each variety to be equally divided between two individuals of each class. Upon reference to the numbers and mottos, the successful candidates were declared to be,—*For Gloucester*,—Messrs William Sanderson, Blackcastle, Lanark; George Hamilton, Mossheart, Lanark. *For North Wiltshire*,—Messrs William Sanderson, Blackcastle; Andrew Nicol, Easterhouse, Lanark.

"The cheeses made in imitation of North Wiltshire, are made exactly as above, only in smaller cheesers. The pine-shaped are put into a cloth, made in the shape of a filtering-bag, when the curd is quite green, and hung, with the point down, for twenty-four hours. They are then put into a net, with a cloth over it, and again suspended the reverse way."

TABULAR NOTE OF ONE OF THE CHEESES SENT.

Date of Making.	No. of Pints of Milk Scotch.	Temperature when Set.	Table-spoonsful of Runnet.	Time of Coming to Curd.	Temperature of the Whey.	Weight of the Cheese when 3 months old.	Quality of the Curd.
June 15.	68	98°	3	1 hour.	90°	20 lb., 22 oz. to the lb.	Very tender.

In connection with the competition of this year, the Society were favoured with a very intelligent and distinct statement from Mr Andrew Nicol, Easterhouse, Lanarkshire, one of the successful candidates, which they doubt not will be acceptable to the public.

"We collect two meals to one making; the evening's collection is run through a fine searce into the milk vessels, and kept over night; the cream is taken off in the morning, and the milk heated to the degree proper for warming the whole mass, which, with the cream and new milk, is run through the searce into the milk-sye (placed on a form), and the proper quantity of colouring * and runnet added, (about a table-spoonful of the latter to fifty Scotch pints, when good, is sufficient.) The mass is then stirred about and well mixed, after which it is covered up, and let stand till coagulated. The dairy-maid then introduces her hand into the mass, and stirs it about slowly, till it is all broken pretty small. After standing about fifteen minutes, the edge of the tub is lifted up, and the whey run off slowly over the lip into a vessel placed below. The tub is then let down to stand a little, after which it is turned one-fourth round, and another collection emptied off. Thus, by turning the vessel a fourth round every time it is let down on the form, the curd is placed in a different position, in order to make it part with the whey more quickly.

"The process is continued till the curd has got a pretty firm consistence; it is then cut a little with a table-knife, and what little whey it then parts with emptied off, and the curd lifted into the drainer.

"This method, I find, makes the whey come off as quickly, and more pure than any other mode I have seen practised. We never touch it with the hand to press out the whey, as I find that the least violence is apt to make it come off white, and so weaken the quality of the cheese.

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* The colouring to be rubbed in a bowl, with a little warm-water, and allowed to stand a little, and then poured off, as even the best is found to contain sand and sediment.

" Being now in the drainer (a square vessel, with small holes in the bottom, with a lid to go within it) the lid is put on it, and a cloth thrown over it, after which it is allowed to stand twenty minutes. A fourth-hundredweight is then laid on it, to lie twenty minutes more. It is then cut into pieces, of two inches square, with a table-knife, the lid put on, and one-half hundredweight laid on it, to lie half an hour. This process of cutting it smaller every half-hour, and adding more weight till there be a hundredweight of pressure on it, is continued for four hours after the first cutting in the drainer, when it will be ready for the chessil (cheese mould.)

" It is then put into a vessel kept for the purpose, with the proper quantity of good salt, and cut with the curd-knife very small. A clean cheese-cloth, rinced through warm-water and wrung out, is then laid on the chessil, and the curd put into it, and a half-hundredweight laid on it for an hour. It is then put into the press (constructed so as to hold four chessils, and the pressure augmented at pleasure), with a pressure of two hundredweight, where it stands three half-hours. It is then taken out, and another cloth, wrung through warm-water, laid on the chessil, and the cheese turned upside down into it, and introduced into the press, with a little more weight applied, to stand all night. Next morning, and ever after, it is changed four times a day with clean dry cloths, till it is properly pressed (which will take at least three days), the weight being always augmented till the pressure be at least a ton weight. A fine round cloth, the size of the chessil bottom, is laid in it, and the cheese put into it, and set in the press for an hour and a-half, in order to give it the proper shape.

" After the cheese is taken from the press, it is rubbed with dry salt, and turned every day for a week or ten days ; after which it is rubbed with a dry cloth, and turned daily for a month longer, in order to keep it from moulding ; after which, every other day will be sufficient. The cheese-room ought to be in rather a cool exposure, and I find it sometimes necessary to cover the new cheeses with a cloth, in order to keep them from cracking.

" As I am anxious to give every information in my power, I have taken a note of the temperatures at each making, immediately after mixing the runnet into it, from the 16th July to the end of August, and have sent the degree of heat at which each cheese in the sample sent for competition was made.

Date of Making.	Number.	DESCRIPTION.	Heat of Milk immediately after mixing in the runnet at 10 o'clock A. M.	Temperature of the Apartment at 2 o'clock P. M.
1825.			Degrees.	Degrees.
July 16.	1	Imitation Wiltshire	95	74
...	1	... Gloucester	95	74
18.	2	... Gloucester	96	65½
20.	2	... Wiltshire	91¾	70
20.	4	... Gloucester	91¾	70
20.	3	Imitation Wiltshire, all new milk	94 { Saturday Evening 8 o'clock.	
22.	4	Imitation Wiltshire	92	70
22.	5	... Gloucester	92	70
25.	5	... Wiltshire	93	66
25.	7	... Gloucester	93	66
26.	6	... Wiltshire	92	67
28.	8	... Gloucester	97	67
Aug. 6.	10	... Wiltshire	97 { Made at 8 o'clock Evening.	
8.	11	... Wiltshire	94½	60

In 1826, the attention of dairy farmers was directed by the Society to two varieties of high priced cheese, viz. Stilton and North Wiltshire. It was also considered more expedient, in a certain degree, to restrict the competition to the counties of Forfar, Lanark and Aberdeen, requiring the successful samples in each local competition to be transmitted to Edinburgh, where a committee of professional judges would finally decide upon the merits. While local premiums were thus offered in the three counties above mentioned, the general premiums to be decided in Edinburgh were open to all Scotland, and included imitations of Cheshire, as well as of Stilton and North Wilts. The Committee having met in the Society Hall, upon the 3d of January 1827, awarded the premium to two *Stiltons*, which, on reference, proved to be the product of the dairy of Mr Sanderson of Blackcastle, and which the judges notice as very well meriting the premium offered. The imitation of Cheshire failed. Some excellent cheeses were produced, but they were not *Cheshires*; and, in reference to this variety, the practical judges remarked that it has always been found particularly difficult to imitate, either in Scotland, or in other counties of England itself.

Three District Reports were received in reference to the competition of this season, viz. from the counties of Lanark, Forfar and Aberdeen.

The report from the county of Lanark is one of much interest, and great attention has been paid by the Convener to all the details. It divides itself into two parts, one containing a Report of the Inspection of the Dairies, and the other the result of the competition in the Cheese.

Mr Lockhart assumed the aid of Mr Balfour, and a separate committee for the inspection of those dairies remote from himself, and the following extracts from their mutual reports will fully demonstrate the trouble bestowed, and the great obligations of the Highland Society to those gentlemen for the manner in which a very laborious duty was fulfilled :—

" In conformity with the directions of the Highland Society, a Committee of three of the Agricultural Association of the Upper Ward, of whom Mr Lockhart is Convener, inspected the Dairies of the three farms in Carnwath Muir, the tenants of which gave notice of their intention to compete for the Cheese Premiums.

" *Kilpethall.* — James Sanderson. He keeps nine cows, of this country or Calder breed, crossed with the Ayrshire; average age six years. Cow-pasture, coarse natural grass. The cows are in the house all night in the summer, and get tares ; in winter they are out in the day time, get meadow-hay at night. Gets five Scotch pints of milk from each cow at an average. Has made ninety stones, all of the same kind ; but cannot say how much milk it takes to make a stone. The kind appeared to be Dunlop, and to resemble Double Gloucester. Dishes all wooden. Never used a thermometer.

" *Easterhouse.*—Andrew Nicol. Nine cows, and part of the time ten. Three of the cows Ayrshire; one Highland cow, crossed with a Calder bull; the rest of the country or Calder breed. The Highland cow, with its cross, gives by far the richest milk; but the Ayrshire the most abundant. Average age seven years. Cow-pasture one field old natural grass, and one field sown out; the natural one far the best pasture. The cows are out all night in summer. The cows are out in the day-time in winter, and get straw and meadow hay, and the second crop of clover, as long as there is any to cut. The average quantity of milk per cow seven Scotch pints. Forty-eight pints of milk will make about eleven stones of Dunlop or Double Gloucester cheese. He had then made 10 stones 5 pounds Stilton, 16 stones North Wiltshire, and 124 stones of Gloucester; total 150 stones 5 pounds, besides maintaining in milk, butter, &c. a family of ten persons, and rearing several calves. The dishes used are wooden. The heat of the milk-house is about 50°, and in making the cheese the heat is about 95°.

" *Skellyhill, Parish of Lesmahagoe.*—James Peats. Keeps eleven cows, of the Ayrshire breed, the average age of which is five years old. The cow-pasture is natural grass. In summer the cows are fed chiefly in the field, and kept in the house during the night. In winter they are fed on straw and hay, and are seldom out. During the year each cow gives seven Scotch pints of milk per day on an average. The farmer here has made 179 stones of cheese this season, in imitation of Wiltshire, besides rearing seven calves; and it takes him about sixty-two pints of milk to make a stone of this cheese. The dishes used are of wood. The byre is thirty-three feet by seventeen. We could not ascertain the temperature at which he kept his byre and milk-house, and he uses no thermometer for any purpose whatever. The Committee were satisfied that this farmer conducted his operations with perfect cleanliness, and we were much pleased with every thing about his farm."

" *At Meadow, in the same parish.*—William Peats. Keeps seven cows, of the Ayrshire breed, and their average age is six years old His cow-pasture is sown grass. In summer the cows lie all night in the house, and are fed on a little clover. In winter they are fed on turnip and meadow-hay, and seldom go out. Each cow gives, on an average, about seven Scotch pints of milk per day during the year, and it takes sixty pints of milk to make a stone of cheese, in imitation of Wiltshire, of which he has made seventy stones this season. He uses wooden dishes. He uses no thermometer, and is ignorant of the heat at which the byre and milk-house are kept. The operations of the dairy seemed to be managed with cleanliness.

From these reports, and some others, it would appear that two important points are still subject to considerable discrepancy, and may be therefore assumed as not yet established upon satisfactory data. These are, the quantity of milk required to produce a stone of cheese, and the average yearly produce of milk from each cow. Mr Lockhart expresses himself strongly impressed by the superiority, in that parched season (1826), of those pastures, where the *native indigenous pasture grasses* prevailed; and states, from his own personal knowledge, that such dairy farms suffered less in proportion, during that perilous season, than any others with which he was acquainted.

The local competition of cheeses was held at Lanark, and was most respectably attended. The premiums, both for Stilton and North Wilts were awarded to Mr Andrew Nicol, Easterhouse, Muirs of Carnwath, a name, as the Report bears, "already well known to the Highland Society as a successful competitor in cheese-making, where the field was more numerously and more obstinately contested." It is proper also to remark, in reference to the Stilton cheese of this maker, that the professional judges who afterwards examined it in Edinburgh, declared that it could hardly be excelled, and was superior to some real Stilton, procured for the purpose of comparison. At this meeting in Lanark some important resolutions were adopted, having for their object the general improvement of dairy farming in all its branches. These have since met with the cordial approbation of the

Highland Society, and will in due time undoubtedly be followed by the happiest results.

The Report from Forfarshire awards the first premium for Stilton to Mr Robert Adamson at Drums; and the premium for North Wiltshire to Mr John Ruxton at Mains of Farnwell. Mrs Speid at Blairna produced a cheese so uncommonly good, that, although it could not be properly denominated an imitation of either Stilton or Wiltshire, they conceived it but fair to award that lady an extra premium.

The competition in Aberdeenshire does not appear to have excited any great interest, which the report from the convener very reasonably explains, by remarking, that butter being the great object of attention in that part of the country, cheese became necessarily neglected. Some good specimens, however, were produced, and the first premium was awarded to Ann Connant, dairy-maid to the Right Honourable the Earl of Kintore; the second to Mr James Morison, Balhagarty; and the third to Mr William Gamack, Whitehill.

In the year 1827, premiums were again offered in Lanarkshire for Stilton and North Wilts. The premium for Stilton was awarded to Mr Andrew Nicol; and for Wiltshire to Mr Sanderson, a second being also given to Mr James Tod, Poniel, and the intelligent convener concludes his report in these words: " The names of Nicol and Sanderson are thus again eminent in the annals of Scottish cheese-making, in imitation of English, and their cheeses are in very high estimation among the private families in the county, and those of the Scottish metropolis."

BUTTER.

The other great branch of dairy produce which comes under notice, is the making and curing of Butter.

The county of Aberdeen, which has long ranked high in the provision trade, annually exports very large quantities of butter, and to it the Society naturally directed its attention, in opening inquiry and competition. It is with infinite satisfaction the Society contemplates the result. For three years previous to the period when the Highland Society offered premiums in Aberdeenshire, the Agricultural Association of that county had been directing its attention to the same object. They found that it had been gradually rising in importance, but that the low price or rather scale of Aberdeenshire butter, in the market, when compared with the product of Ireland and Holland, effectually demonstrated the system of management to be defective. To remedy this evil, local premiums were offered, and a very excellent practical paper, circulated upon the subject, to the following effect :—

OBSERVATIONS ON THE MAKING, CURING, AND CASKING OF BUTTER. *Drawn up by order of the Agricultural Association, as the result of Inquiries into the practice adopted in Ireland, and of the Experience of some extensive Curers in the County of Aberdeen.*

" 1*st*, The milk-house or dairy should have no internal communication with any other building. It must be kept free from smoke, well aired, and clean ; and no potatoes, fish, onions, cheese, or any thing likely to impart a strong or bad smell, should be kept therein : in short, nothing but the dairy utensils, which must also be kept sweet and clean.

" 2*d*, The milk, when brought in from the cows, should be strained through a fine hair searce or drainer, and, when cool, put into sweet well-seasoned oaken cogs, keelers, or milk-pans—the latter to be preferred. A tin skimmer, with holes in it, is the best for taking off the cream, which should always be churned while the cream is fresh.

" 3*d*, The churn, whether plump or barrel, should be made of the best well-seasoned white oak ; and as cleanliness is of the first importance, great attention should be paid to the washing, drying and airing of the churns, immediately after use, otherwise they are sure to contract a sour and unwholesome smell, which must injure the quality of the butter.

" *4th*, The butter, *immediately after being churned*, should be thrown into fresh *spring-water*, where it should remain for one hour at least, that it may grow *firm*; and, at the end of the third or fourth washing, some fine salt should be put into the water, which will raise the colour of the butter, and purge away any milk that may remain among it. Before salting, it is very essential that no milk or water be left, otherwise a strong smell and unpleasant taste will be the certain consequence.

" *5th*, The butter thus prepared should be *immediately salted*. The proportion of salt may be from one and one-fourth to one and one-half ounce of Scotch salt for the pound of butter; or, of the best stoved rock or bay salt, one ounce for the pound. But when butter is not intended to be kept through the winter and spring, or for any long period, the quantities of salt above recommended may be somewhat reduced, the curer exercising his own judgment in doing so.

N. B.—In Ireland, the use of salt and saltpetre is recommended in proportions of one ounce of stoved rock or bay salt, and one-fifth of an ounce of saltpetre to the Aberdeen pound *.

" *6th*, It is a very injurious practice to keep a making of butter uncured to the next churning, for the purpose of mixing the two together. This mode invariably injures the flavour of the whole, and renders it of too soft a quality ever afterwards to get firm. This applies to curers, who are the producers of the butter; but as the greatest quantity of the butter, in this country, is collected and cured by merchants, they are particularly cautioned against the too common practice of throwing the fresh butter together, and retaining it in that state for days, until they have collected what they consider a sufficient quantity to commence curing. The butter treated in that manner is invariably found inferior to what is salted shortly after churning. Should, however, there not be a sufficient quantity collected in one day to fill a package when cured, the quality of the butter may, in a great measure, be preserved, by giving it a partial salting, and covering it over with a clean linen cloth, dipped in pickle, and placing it in a cool situation. Country dealers, who are in the habit of sending carts through the districts where they reside to collect the butter, should endeavour to arrange it so between themselves and the makers of the butter, that it is churned upon the day it is called for.

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* All these calculations are made for the Aberdeen butter pound, of 28 ounces Avoirdupois, and the salt of 16 ounces to the pound, of same weight.

" *7th*, When the butter is cured, it should be tramped firm into the firkin with a round wooden tramp-stick, of sufficient weight and thickness. The firkin should be filled up to the cross, and then covered over with a little of the purest salt,—sufficient room being merely left for the head of the cask, which must be well secured, to exclude air, and to prevent the pickle from getting out.

" *8th*, The Liverpool stoved salt, or Portugal St Ube's, or bay salt, is, from strength and quality, always to be preferred. All salt must be kept quite dry, and at a distance from the fire, to prevent its imbibing the smell of the smoke. If kept in a cask, a little unslacked lime placed under it, will prevent it from drawing moisture from the ground.

" *9th*, The mixing of the salt with the butter should be done in wooden dishes, after the water and milk are completely expelled, and no time should then be lost in tramping it into the firkin, which will make it draw even and firm.

" *10th*, The milk of new-calved cows should never be set for butter until at least four days after calving, as a small quantity of beast-milk butter will injure a whole firkin. The practice of scalding cream in cold weather should also be avoided, as cream thus treated will never make good butter.

" *11th*, Great care should be taken not to steep the firkins in boggy or unwholesome water. Nothing but the purest spring or clear running water should be used for that purpose; and the firkins should be rendered perfectly dry inside, after being steeped, either by long dripping, or by being rubbed with a smooth towel. Old butter should never be mixed with new; and the lining of the casks with inferior sorts, or grease-butter, is a practice which cannot be too much reprobated.

" *12th*, The casks ought to be made of the best oak or ash *, (the former to be preferred), and the largest size should not exceed 84 lb. gross, or 3 stones Aberdeen butter weight, that being the size used in Ireland, and most convenient and saleable in the London market. The casks should be tight and well hooped. Beech, plane, alder, &c. should never be used, as that quality of wood is more apt to absorb the pickle, and, independent of the injury thereby occasioned to the butter, it will often lead to disputes about the tare."

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* See Hints by George Moir in regard to the choice of timber for casks.

Nearly akin to these observations, are some hints upon salting and preserving butter, by George Moir, salt manufacturer, Edinburgh, communicated to the Highland Society, by the Right Honourable Sir John Sinclair, Bart., and which are in many respects highly interesting.

Hints on the best means of Salting and Preserving Butter. By GEORGE *Moir, Salt Manufacturer, Edinburgh.*

"The first object is to choose proper wood for the casks.

"The second, to manufacture salt of the most efficient quality.

"1. The lime is pre-eminently suited for the manufacture of butter casks. It is the only wood *free of acid,* a point which *I have ascertained by innumerable experiments.* In the manufacture of basket salt, the splits for the baskets were at first made of ash, from the circumstance of that species of wood being particularly straight in the grain. I found, however, that the acid in the ash decomposed the salt. I then made trial of every kind of wood I could come at, and found none but the lime to be free of acid. Next in order was the fir. The acid acts most powerfully on salt, decomposes it, and makes it run into a liquid, which I have proved by a hundred experiments. In one instance, I got a tree of poplar, white as writing paper, and made it into baskets. I filled fifty dozen of them with salt; when they were in the stove I anticipated perfection itself, but to my great surprise and disappointment, on being exposed to the air for half an hour they became all covered with spots, red as blood. When put again into the stove for some time, the spots disappeared, but when exposed to the air for two or three days, the wood became as dark as mahogany, and retained that colour. Nor was this all; every one of the fifty dozen of baskets became quite empty by decomposition, and many of them after having been twelve months in the stove. This induced me to endeavour if possible to extract the acid from all kinds of wood before using it.

"The following is the plan which I have adopted. Cut the wood into deals of the lengths wanted; have a boiler, of a square form, the length of the wood, full of water: put in the wood with a weight or pressure, to keep it immersed in the water, and have a wooden cover on the boiler, as it must be done by close evaporation. When thus boiled for *four hours*, the whole of the pyrolignous acid will be extracted. The wood is then dried for use. It becomes closer and more condensed, from the fibres being contracted. By this method, while the wood continues hot, it can easily be brought to any shape, and used for various purposes, and this is the only mode by which barrels for salted butter should be made.

"2. In regard to the salt, it should be marine sweet salt, free of *bittern*. The mineral salt contains a great proportion of sulphuric acid, and always has a bitrer taste. There is a great deal of sulphuric acid in sea water. In making salt skilfully, this will remain with the bittern, as the sulphate of soda and the sulphate of magnesia only form by cooling; still if the bittern is urged too far by heat, it will form into a mass, and mix with the salt. The salt should be drawn to the side of the pan, as soon as formed, and this plan should be persevered in, until the whole of the pure salt is extracted from the brine; about one-fifth part of the brine will remain, which should be then boiled into common salt That will contain all the sulphate of magnesia and sulphate of soda that was in the brine; this brine can be manufactured into Epsom salts, *the sulphate of magnesia*, without any addition of sulphuric acid, except what the brine contains. In my salt operations the sulphate of soda and the sulphate of magnesia constantly form on the sides of the casks, and to a greater degree if the atmosphere is cold. What marine salt I use for basket salt, I manufacture at Mr Cadell of Cockenzie's salt-works, and I make about a ton at a time, in the way above stated. I have often heard the grocers complain that they sustain great loss from the quantity of brine that runs from their butter casks. This must be occasioned *by the wood*, and not the salt, as salt incorporates with oil, owing to the great proportion of soda it contains.

"In preserving butter, to each pound weight of salt should be added four ounces of raw sugar."

The lime is a tree which must ever be a distinguished ornament of our woods; and if experience shall corroborate the valuable and special properties now ascribed to it, it must henceforth occupy a higher station in the ranks of useful and profitable timber, than has hitherto been its lot.

In 1825, premiums to the amount of nearly L. 100 Sterling, were offered in the county of Aberdeen, partly from the funds of the Local Association, and partly from a grant made by the Highland Society. This competition excited very great interest, and was conducted in a manner highly creditable to all concerned. The judges appointed, after a most minute inspection, and having stripped off the casks, to prevent all allegations of partiality or deception, awarded various premiums *.

It may appear somewhat uncommon to find these premiums, without exception, awarded to individuals engaged in trade; but the practice of that part of the country will explain this circumstance; it being usual for persons so engaged to procure butter from the farmers, by means of itinerant agents, and to carry on the processes of salting and curing within their own premises. Such a system, when well organized, and carefully followed up, may evidently be attended with much advantage, as casks of butter made at *one churning*, though perhaps from several different farms, may thus be cured and barrelled without incurring the hazard of injury from exposure to the air, as in our more tardy and ordinary process.

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* The following were the successful competitors, in the order in which the premiums were awarded:—Mr Robert Morison, baker, Peterhead; Mr James Anderson, merchant, Inverury; Mr John Rae, merchant, Ellon; Mr Joseph Fowler, merchant, Rhynie; Mr Alexander Monro, merchant, Old Meldrum.

The judges state, that it is " with much pleasure they have to report the very successful result of the competition, and to mention the following very important facts. The value of butter exported from Aberdeenshire is, for the present year, little short of L. 100,000. The Aberdeenshire butter was, prior to the year 1823, ranked in the market as only equal to Irish butter of the fourth quality. It now sells freely at about the same price as Irish butter of the *first* quality. It is only generally inferior to the best Dutch, about 5s. to 6s. per cwt., while the difference was formerly not less than 30s. per cwt. or L. 30 per ton."

Nothing could exceed the attention paid by Mr Thomson of Banchory, the convener, and his Committee, in arranging the details of the Aberdeenshire competition.

In 1826, the attention of the Society was directed to the county of Dumfries, the vicinity of which to the county of Cumberland, so distinguished in the butter trade, gave an interesting prospect of rivalling their border neighbours. The details were confided to the Reverend Dr Singer and to James Bell, Esq. of Woodhouselees, gentlemen whose well known intelligence and zeal secured every attention to the objects in view. The competition took place at Ecclefechan on the 31st October, and the commissioners reported, that the subject had excited general interest in that part of the country, both among the principal farmers and the dealers in butter; that the butter trade of that district has been of late improving, and is susceptible of much further improvement; and that, upon the whole, it is becoming so considerable an article of commerce as to justify a continuance of the premiums in the county for some time longer.

This suggestion having been complied with, a competition again took place at Ecclefechan on 16th October 1827. The Committee report, "That they were highly gratified, both in respect to the quality and quantity of the butter produced, and beg to express their opinion, that the premiums have proved of material benefit to the country, as interesting a great many farmers present, as well as the competitors, in the comparison of this staple article of produce, and, of course, as tending to improve the excellence of the quality. It appears, also, to be attended with another useful consequence, viz. the establishment of an annual market at this place for the sale of butter, which will tend much to encourage the production in the district. Dealers attended who purchased the whole quantity exposed."

Such are some of the leading circumstances which have occurred under the patronage of the Highland Society, in regard to the improvement of cheese and butter in Scotland, within these last few years. The subject is undoubtedly one of considerable interest, and presents a field where much improvement remains to be effected, and where we confidently anticipate, ere many years elapse, a change at once creditable and profitable to the dairies of Scotland.

Butter and cheese may be esteemed by some rather luxuries than absolute necessaries, but, at all events, they are known to be wholesome and palatable articles of food, in universal demand; and it is satisfactory to know that they can be produced in the most remote parts of the island, not only in the greatest abundance for general use, but of a quality to please the most fastidious palate.

The exact annual consumption of cheese and butter in Scotland, or even the proportion of each, annually imported, under duty, cannot be very easily ascertained. We can state, however, with confidence, that from L. 20,000 to L. 30,000 worth of foreign butter and cheese enters the Port of Leith alone, in one season, independent entirely of the importation from England and Ireland; while Glasgow and Greenock consume butter and cheese, the produce of the United Kingdom, to the annual value of L. 160,000; and we have seen that Aberdeenshire alone exports butter to the annual amount of nearly L. 100,000.

Such being the extent of this trade, we have little reason to doubt that a market will be always found, and that the demand will increase in an exact ratio with the regularity, improved quality, and moderate price, with which a better system of management shall enable dairy produce to be supplied: and it is not unreasonable to anticipate, that increased skill and attention applied to this branch of industry, will, at no distant time, relieve us from all necessity of drawing, for our supplies, upon the dairies of Holland and other countries.

It might lead into a field of inquiry too extensive, and would perhaps be diverging from the object of this paper, to enter into any detailed illustration of the national advantages which a more extended scale of dairy farming might be expected to produce. Suffice it to observe, that, among the many schemes which have been agitated for the relief of the agricultural classes, this may be stated as one highly deserving of regard, and which, while it might amply recompense the owner and occupier of the soil, must recommend itself to the favour of the manufacturing and commercial classes, as increasing the objects of consumption and internal trade.

OBSERVATIONS ON THE USES TO WHICH ALDER, BIRCH, HAZEL, AND OTHER INDIGENOUS TREES, GENERALLY ACCOUNTED BRUSHWOOD, MAY BE APPLIED. *By James Blaikie, Esq. Advocate, Aberdeen.*

There is perhaps no branch of rural economy more interesting than the formation and improvement of woods and plantations. Whatever the ultimate object may be, whether ornament, shelter or profit, the progress of trees in every stage of their growth cannot fail to excite feelings of satisfaction and delight. Besides, it is really a duty incumbent on proprietors to contribute, as far as circumstances will permit, to the comfort, convenience and general benefit of their posterity, by planting their waste grounds, and so adding to the beauty of the country, the value of their estates, and the consequent increase of their fortune. It is not, however, my intention at present to enter upon the many interesting topics which sylvan vegetation might suggest, my object being merely to offer a few remarks respecting the trees which, among us, are usually accounted brushwood. For this end, it is not considered necessary to institute a minute inquiry into the varieties of these trees, or to offer a botanical description of them, but rather to point out the qualities which the kinds most generally known in the country are found to possess.

Were more attention bestowed on this class of trees when in a young and vigorous state, their size and value would be very materially increased. In the smaller hard woods, the main object ought to be, the increase of size, because there is a most material difference in the uses to which a large and a small sized alder, birch or mountain ash, may be applied; and, of course, there is a corresponding difference in their value.

THE ALDER. *Alnus glutinosa.*

The Alder, by proper management, may be trained into a tolerably handsome and sizeable tree, and although partial to a wettish soil, it will thrive in most situations, and answer uncommonly well in low moorish ground, on which it is difficult to raise other timber. The good qualities of the alder are not generally known. Its appearance is dull and sombre, and it has accordingly been long and much neglected, and is commonly permitted to grow into a low and deformed bush, possessing neither utility nor beauty; whereas, by proper management, it is capable of being converted into boards and cut into scantling of convenient sizes, which its peculiar, and almost exclusive, qualities render highly valuable.

One advantage which the alder possesses over most other trees, is the quality of resisting the operation and the effects of water and moisture, and of continuing for a long period under ground in a sound and healthy state. It is therefore well calculated for piles on which to found the piers and abutments of bridges, and to support the foundation of all buildings in wet or boggy places; and, accordingly, it has been much used in this way, not only by the moderns, but also by the ancients, as appears from Vitruvius and other authors. It answers well for rail-posts and fences, for sluices and flood-gates, and for making pumps and pipes for conveying water below the surface, for all which uses it is found equally economical and durable; and it is likewise preferred in the construction of water wheels of all kinds.

The same quality of resisting moisture renders the alder very useful, when cut into staves and employed in the manufacture of firkins and other small barrels and casks. In its present dwarfish state, and perhaps even when raised to a larger size, this is the most general and most profitable use to which it can be applied, a very great proportion of the barrels used by the herring-curers on the east coast of Scotland being formed of it and birch, whenever these woods can be procured; and, for this purpose alone, both meet a fair and a ready sale even at considerable distances from the sea.

The alder is occasionally used as flooring to galleries, and other large apartments, and, when properly prepared (which is indispensable to its durability) and well kept, it produces a rich and very striking effect. It is rather problematical, however, how far this application of the alder is to be recommended. The writer of these remarks has personal knowledge of two instances in which it has been so employed: the one is at Glammis Castle in Forfarshire, where the dining-room is floored with alder, and where the flooring is remarkable for its beauty; but on a late examination, it exhibited, in some places, unquestionable marks of decay, although it was stated not to have been laid above forty years since; the other was at Keith Hall, the seat of Lord Kintore in Aberdeenshire, where the dining-room, and some of the other apartments and passages, were floored with the same sort of timber. It however speedily decayed, and within forty years after its being applied to this purpose, became so completely rotten, that its removal was found necessary.

For many ordinary purposes, there are really few trees better calculated than the alder. By brushmakers, as well as by makers of shoe-lasts, shoe-heels, pattens, clogs, and such like articles, it is positively preferred, because it is not injured by moisture, and because it is light. It is much sought after by curriers, who willingly give high prices for blocks of good quality. The bark of the black alder dyes a very good black colour, and cabinet makers use the white for what is called stringing in veneering.

For the making of wooden ladles, bowls, platters, and such utensils, it is considered superior to most other timber. It is likewise much esteemed by ploughmen for many purposes connected with husbandry: the boxes of carts, wheel-barrows, harrows, and even parts of the plough may all be formed of alder. It is very useful in making rough sledges for carrying off large stones, which are too unwieldy to be carted from land in the course of improvement; and it can also be very beneficially employed in every purpose for which timber is required in working mines and coal-pits.

The importance of alder in the manufacture of gunpowder is universally known, and offers a considerable inducement for raising it in the neighbourhood of such establishments: it forms the finest charcoal, and is therefore peculiarly valuable. In all situations it furnishes excellent firewood, and, as it grows freely in wettish worthless soil, in which it is difficult to raise other trees, it is well deserving of more attention than it receives; and indeed only requires the care usually bestowed on other sorts of timber, to raise it from its present rank of brushwood to that of a most useful and valuable tree.

THE BIRCH. *Betula alba.*

This highly ornamental and very favourite tree may be considerably increased in size and utility, by a little attention during the early part of its growth.

Indeed, the difference between one tree of any kind, properly pruned and kept in shape, and another permitted to ramify, and form various stems, and grow up of any figure which it may happen to assume, is inconceivable; and unless some pains are bestowed on the birch while young, its value and usefulness when old will continue of a very secondary description.

The birch is a tree which will push forward any where, although it succeeds best in a light soil. It thrives well in elevated situations, and so easily is it reared, that there are extensive tracts of natural birch to be found in many districts of England and Scotland. It delights in the steep banks of rivers, where it generally attains the greatest dimensions, and in the sheltered side of deep glens, although it is often met with in the most exposed and arid situations.

In many respects the timber of the birch-tree is similar to that of the alder, and it is accordingly frequently applied to similar purposes. The most general and the most profitable use to which birch (like alder) can at present be turned, is unquestionably the manufacture of small casks. It is well qualified for making herring-barrels, which, now that the herring fishery has become an object of such national importance, and is so eagerly followed by almost every fisherman in the northern and western parts of Scotland, are required to a great extent every season. But it is also particularly well adapted for being converted into butter-casks, because it is stout, clean, and easily wrought, and communicates no peculiar taste or smell to the butter.

It is impossible to form any accurate conjecture as to the quantity of staves annually required for these two branches; but the alder and birch woods of this country do not at present supply one-twentieth part of the quantity which are used in the manufacture of herring barrels and butter casks alone, large importations being annually made from North America and the Baltic, although many uncultivated tracts at home are well calculated to raise these trees, by a very little trouble and attention, in the greatest perfection and abundance. Both alder and birch may be cut into staves of proper dimensions where they grow, and thus a great expense in carriage may be saved, because those parts only, which are really useful and profitable, and equal to the coast of carriage, will be removed. In promoting the herring fishery, and the improvement of dairy produce, the value of alder, birch, mountain-ash and willow, has also been materially increased; and plantations of the two former, which were lately considered as worth little or nothing, and chiefly cut for firewood, now bring in fair returns.

At one period a great proportion of the birch raised in the upper parts of Aberdeenshire, and the adjoining woods of Kincardineshire, was brought to the annual fair, or "the timber market," as it was called by way of distinction, held at Aberdeen in autumn. Since the alteration, however, on the distillery laws, and the establishment of small stills throughout Scotland, a considerable opening for the smaller sized birch has been found in these distilleries, where it is consumed with much success in drying the malt used in the manufacture of whisky, as it communicates no disagreeable taste to the malt, or unpleasant flavour to the spirit, and the heat which it produces is strong and steady. When it happens to grow bent or crooked, it sells very readily to boat-builders, who form the timbers, as they are called, of boats from it. Indeed, all sorts of hard wood, of sizes fit for ship-building or boat-building, are of more value when crooked than when straight; and it is even of importance to force trees to assume a crooked form, by bending the stems when young, in the neighbourhood of places where these branches of business are carried on. The lastmaker, the shoemaker, the collier and the turner, all find the birch useful in their various occupations; and in cotton manufactories a great deal of the smaller machinery is turned from it. The bark is also in some demand for tanning; and although in this respect it is not so powerful as that of the oak, at least by our mode of preparation, yet fishermen generally prefer it as a tan for their nets. Cotton printers in this country, but more particularly dyers in France, apply it not only as an astringent in preparing cloth for receiving the different printing colours and dyes, but also as a dye itself, as by different chemical operations and combinations it forms a variety of shades of brown. Both Germans and Russians employ it in producing the oil which they use in tanning leather, and which imparts to the leather so peculiar an odour that insects will not touch it. Although birch, to be used as a tan, will peel earlier than oak, yet this operation is seldom begun until the peeling of the oak has been completed, as there is an outer skin on birch which must be removed, because this outer skin is not only of no use as a tan itself, but also renders the useful part of the bark more difficult to be ground at the mill; so that it is generally towards the middle or end of July before the two barks can be separated with ease.

Nicol says, that in the natural woods of oak and birch in the Highlands, both are cut indiscriminately for peeling, and that the bark of the latter is nearly as valuable as that of the former, and always fetches within one-fifth of the price of oak-bark. For the purposes above mentioned, birch commonly fetches from one shilling to one shilling and sixpence per cubic foot, and the weeping birch readily gives from one shilling and sixpence to two shillings, principally on account of its superior size.

In Sweden the leaves of the birch are frequently gathered and given to the feeding stock; and, in this country, a cool and highly agreeable beverage was formerly produced in great quantities from the sap, so that every part of the tree is capable of being converted to some economical and profitable use.

Still, however, it must be admitted, that the birch, although highly ornamental and agreeable both to the eye and to the smell, and, at the same time, useful and convenient for many purposes, is not, and probably will not, become, in consequence of its diminutive size, of first rate value as timber, and is not likely to come into competition with any of the larger hard woods. It will, however, continue to be cultivated for its many useful and ornamental purposes, and will always make a fair return for any expense and trouble bestowed upon it.

THE HAZEL. *Corylus Avellana.*

This tree, even in England, is never cut as timber; it however gives an early, though not great return, for it soon becomes fit for cutting into sticks, hoops and small poles. The most profitable mode of using it is not as brush or underwood, but by raising coppices, which, when of a proper size, may be cut down for hurdles and stakes, and the smaller stems taken for hoops and similar purposes. The operation of cutting down may be repeated every eighth or ninth year afterwards, and thus bring in occasional profit. Next to the alder, the hazel is perhaps the best wood for converting into charcoal, for the use of gunpowder-manufactories; and now that the qualities of the pyrolignous acid are so well understood, and the hazel so much used, and even preferred, particularly in the establishments for producing that acid in Glasgow and its neighbourhood, a new channel for the consumption of this wood has been opened. It forms very good underwood in plantations, and, independent of the fruit, is well worthy of attention (as it grows freely on all dry and rocky soils, however cold and poor), even for the few purposes which have been mentioned.

As the hazel is never of a size to be sold by measure, it has been found impossible to procure any correct information of its value, or to ascertain any general or average price for which it is commonly sold. The worth depends so much upon circumstances, that a special bargain requires to be made for every lot, and consequently there is no comparison betwixt, and no uniformity amongst, the variations which take place in disposing of and purchasing it.

THE WILLOW. *Salix.*

Although, strictly speaking, the willow may not come under the description of trees to which these observations ought to be confined, yet it is so easily raised, and so well known, that it is hoped a few remarks on the uses to which it is applicable, will not be considered either misplaced or unimportant.

There is a prodigious variety of willows, and the rapidity of their growth, and the quick returns they make, ought to render them objects of attention in all situations which are fitted to raise them. The uses to which the osier or hoop willows are applied, are so well known, that it would be wasting time to enlarge upon them; and if the quantity of herring-barrels, butter-firkins and salmon-kits be so large as has been mentioned above, and as there is no doubt it is, it follows that the consumption of hoops must at present be, and increase, in the same proportion. For many years a large sum has been annually sent to Holland for hoops, which it would be easy to keep at home, for there are few estates which do not possess spots of wet and marshy land well adapted for raising osiers. The consumption of the basket-willows, in all kinds of wicker-work, is very great, and the perfection to which that art is now brought, and the consequent demand for articles of that manufacture, ensure a demand at all times for any quantity of that sort of willow likely to be raised in Scotland.

The willow tree, or saugh, is a very useful and valuable tree; it is both tough and strong, and therefore much used about coal and lime works, for facing or lining waggons, buckets and such like articles, and it is perhaps the best wood that can be employed for making the ring, and more particularly the buckets, of mill-wheels. When fit for that purpose, it sells at a high rate, from two to three shillings, and even more, per cubic foot, being no uncommon price. For carts to carry stones, and waggons in which large substances are to be transported, it is greatly in request, because being so tough, it does not splinter from the stroke of a heavy hard body, and it is now very generally used for the boards of the paddles of steam-boats for the same reason. The willow, and all the softer woods, ought to be stript of the bark, and laid in water for some time before being used, as this process renders the wood more durable, and the bark itself may be thus easily preserved, not only without detriment, but with advantage to the timber. The willow yields a larger proportion of bark than most of the other trees, and the tanning principle is tolerably strong. In estimating the quantity of bark on the saugh or willow tree, Menteath states, that every foot of measured timber produces from nine to eleven pounds weight; and he found by experiment the tanning principle in the bark to be only a degree fainter than in that of the Spanish chesnut, and stronger than in either the birch or rowan tree. The general price may be stated to be between one shilling and threepence, and one shilling and sixpence, per cubic foot.

THE MOUNTAIN ASH. *Pyrus Aucuparia.*

The mountain ash, or rowan-tree, resembles the common ash in many of its qualities; but although it rises to a considerable height, it very seldom grows with a proportionate diameter, and if the trunk happens to swell to a moderate size, it generally becomes decayed and hollow within, which is very much the case with all fruit-trees. Should it, however, happen to attain a good size without internal decay, as it frequently does in the north of England and Wales, it is then a very valuable tree, because the timber is strong, tough, and large enough for every ordinary purpose. It is then valued and sold at 2s. per foot, and can be turned to every use to which the smaller-sized ash is applicable. Shafts of carts, harrows, oars, ladders, and many other useful implements, may be made of mountain ash. The bark possesses a degree of tanning principle, and is sought after by fishermen for tanning their nets, but is not much used for any other purpose.

In Scotland mountain ash is seldom sold by measure, on account of its small size; but where it is disposed of by the foot, the price varies from 1s. to 2s. according to the quality and dimensions.

THE POPLAR. *Populus.*

There is a great variety of poplars mentioned by botanists, but those which are best known, and generally raised in this country, may be reduced to three,—the white poplar or abele *(Populus alba)*, the trembling poplar or aspen *(Populus tremula)*, and the black poplar *(Populus nigra)*, which are all very useful in many respects, and more valuable for various purposes than is generally imagined. Indeed, in many places a prejudice seems to exist against the use of this timber. It is considered soft, spongy, apt speedily to decay, and not fitted for ordinary purposes; and therefore a fair trial has scarcely been given it, or any pains been taken to ascertain and prove its qualities.

The poplar (speaking of the varieties above mentioned in general) is a quick grower, and is frequently planted to cover unsightly objects, for which its rapidity of growth eminently fits it. In boggy lands, coppices of those trees may be formed at small expence, and they may be cut at the end of seven years, and every four or five years afterwards, for poles, rails, firewood, and similar purposes. In many respects, the poplar is a useful substitute for ash, being both light and tough. It furnishes excellent materials for the pannels or trees of saddles, in the manufacture of which a good deal of it is required. The sides of waggons and carts, and tables, chairs, and other articles of household furniture, are frequently formed of it. When not exposed to damp or moisture, which it is not well qualified to resist, it may be used for floors and rafters.

The price of poplar varies on account of its quality and size, and the purposes for which it is intended. In Inverness-shire, where it is generally used for inferior purposes only, it sells from 8d. to 1s. per cubic foot; in the more southern counties it gives above 1s. 6d., and in some parts of England, where it is cut into boards, it brings from 1s. to 2s..

In common with the saugh, it is used about coal and lime works for lining barrows, buckets, and carriages, as it is not apt to break or split; and when fit for that use, it generally sells from 1s. 2d. to 1s. 4d., or even 1s. 6d. per foot. There is no sort of timber, however, so well calculated for converting into packing cases as the poplar, and the consumption of wood in this way in Great Britain is almost incredible.

HOLLY, *Ilex Aquifolium*; and BOX, *Buxus sempervirens*.

The uses to which these trees are applicable, and their great value, are so well known, that it is hardly requisite to offer any remarks upon them. The object in planting Holly being almost always ornament, and not profit, it is raised in situations where, when it grows up, the proprietor is averse to parting with it, and of course the quantity which is brought to market is but small, and the price high.

It is a pity, however, that this tree is not reared in greater abundance. Independent of its beauty in winter, when the face of nature is so bleak and sombre, and when its beautiful foliage and scarlet berries relieve and delight the eye, the finest hedges, rising in some cases to the height of 20 to 30 feet, are formed of it, affording complete protection and security, and the most grateful shelter; whilst for the finest mathematical instruments, the nicest fancy articles, and the lighter parts of machinery, the timber cannot be exceeded.

The common holly will grow in most soils, and its bark, when fermented, and afterwards washed from the woody fibres, makes the ordinary bird-lime. It is the whitest of all the hard woods, and is therefore used by the inlayer. When dyed black, it forms an excellent imitation of ebony. The handles and stocks of tools, the sheaves of blocks and pulleys, and even hones for setting razors, are made of it; and as it receives a high polish, it is manufactured into various kinds of furniture.

The Box is useful for various purposes, although the English wood is reckoned inferior to that imported from the Levant and America. It is smooth, hard, and not apt to warp, and thereby fit for the turner, engraver, carver, and mathematical instrument-maker. The comb, pipe, and flute makers, all employ it in their various arts; and wheels, pins, pegs, rulers, pestles, tables, screws, and such like, can be formed from it. The box is little known in Scotland, and is not so common in England as it formerly was; but were attention paid to raising it in this country, it would ultimately make a handsome return.

Concluding Remarks.

None of the smaller woods have hitherto been much employed in the construction of machinery. Oak, ash, elm, beech, and plane, have been principally resorted to; and as the use even of these has been materially retarded by the various modes in which iron is now applied, there is no room for expecting any consumpt in that way. The extension of the herring and butter trades, however, and the introduction of the circular saw, have operated very favourably in raising the value of alder and other underwoods, and opened an ample field for disposing of them. These saws may be attached to a thrashing-mill, should there be one in the neighbourhood; and if not, portable ones may be constructed at small expence, to be impelled either by water, by horses, or by human power. As there can be no doubt that the demand for small staves will be great and increasing, it would be a likely speculation to raise both alder and birch in situations where there is no chance of rearing oak and more valuable timber to perfection, for that purpose alone, especially as the expence of carriage will be so much reduced by conveying the staves to the places of consumption in a manufactured state, whereby the foreign hard woods, burdened with the freights and duties in which they are liable, would be unable to compete with the native produce; and in case this country were again to be embroiled in disputes, or engaged in war with the United States and the northern powers of Europe, our fishermen and merchants would be able to supply themselves at home with all the casks they would require, and thus, in one respect at least, be independent of their enemies.

To allude to the making of packing cases as opening a demand of any extent for the consumption of poplar, may at first sight appear to many to be fanciful and ridiculous. But those who are best acquainted with the American timber trade, will readily bear testimony to the correctness of the observations already made upon that point, and admit that, before the late stagnation, large quantities of yellow pine were sold as high as from 1s. 10d. to 2s. per foot, to be so employed, at most of the principal ports in Britain.

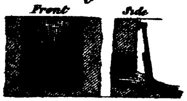
The extended manufacture of the pyrolignous acid and of charcoal, forms another inducement for cultivating small timber. In the neighbourhood of large forests, small establishments might be set a-going for consuming in this way the refuse of all sorts of wood after the more valuable parts had been selected and sold.

In a country such as Scotland, so bare and so exposed, with so great a proportion of waste land, which never can be brought into cultivation, or be beneficially employed in pasturage, and which only affords a temptation to the poorer peasantry to keep more cattle in summer than they can possibly preserve from starving in winter, planting cannot be carried to excess; and could the arrival of a period be contemplated when timber shall be raised in such abundance as to become utterly unsaleable, still the shelter, and the consequent improvement of the climate—the ornament of the country—and the accommodation and conveniency afforded to every estate, by a supply within itself of all the timber it might require for buildings, inclosures, farming utensils, firewood, and every other purpose—would far exceed the expense of planting, and prove an ample remuneration for the trouble of attending to and preserving it.

PLATE VI

DRAINAGE of the BARR LOCH

Fig 2



Valve or selfacting Sluice

Fig 3

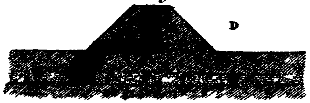
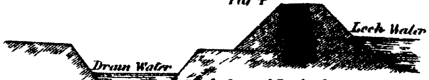


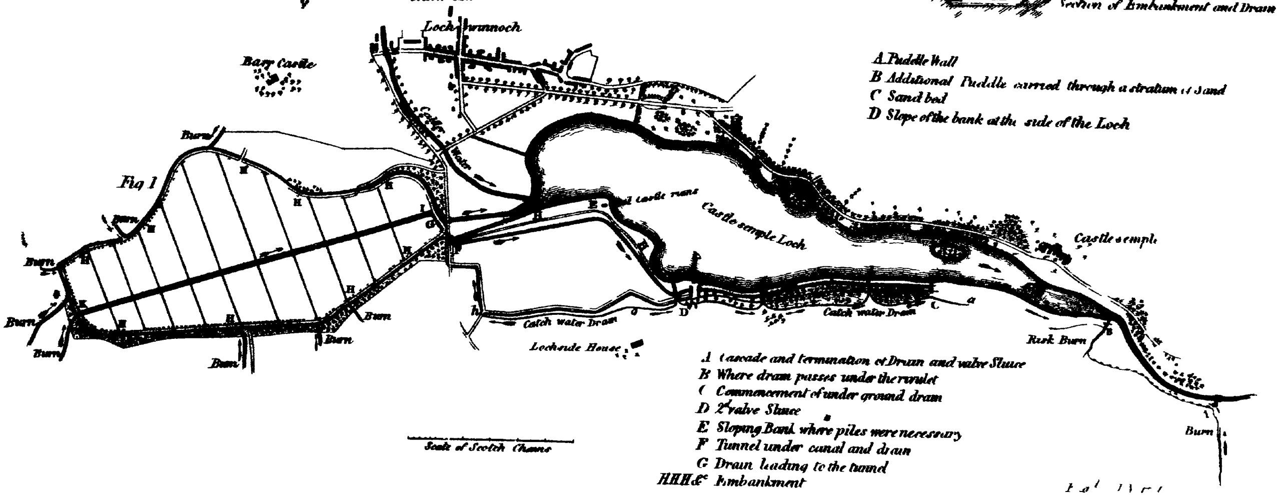
Fig 4



Section of Embankment and Drain

A Puddle Wall
B Additional Puddle carried through a stratum of Sand
C Sand bed
D Slope of the bank at the side of the Loch

Fig 1



A Cascade and termination of Drain and valve Sluice
B Where drain passes under the rivulet
C Commencement of under ground drain
D 2^d valve Sluice
E Sloping Bank where piles were necessary
F Tunnel under canal and drain
G Drain leading to the tunnel
HHH &c Embankment

ACCOUNT OF THE DRAINAGE OF BARR LOCH AND ADJOINING LANDS, SITUATED IN THE PARISH OF LOCHWINNOCH, AND COUNTY OF RENFREW. By *JAMES ADAM, Esq. W. S.*

The lands called the Barr Loch, formed originally a part of Lochwinnoch Loch, sometimes called Castlesemple Loch, and were part of the estate of Castlesemple. The waters of Castlesemple Loch covered about 500 acres of a very deep deposite, consisting of rich earth, washed in the course of ages from the neighbouring arable and pasture grounds, with a small proportion of moss, and a quantity of decomposed vegetable matter.

This loch received its waters from Kilburnie Loch in Ayrshire on the west, and the river of Calder on the north, besides some other smaller streams, all of which are discharged at its eastern extremity by the river Black Cart, which falls into the Clyde, after its junction with the White Cart at Inchinnan Bridge.

The river of Calder flows with great rapidity from the mountains which divide the Frith of Clyde from the parish of Lochwinnoch, and has evidently filled with alluvial soil a considerable extent of what was formerly part of Lochwinnoch Loch, so as in fact to separate that loch into nearly two parts, the upper part being called the Barr Loch, and the lower part the Castlesemple Loch. At this place of separation a ferry-boat had formerly been kept; and, more lately, a road was formed, having a bridge, to allow the passage of the water. By this means the separation was completed, except by the communication of the waters under the bridge, and in floods, when the road was overflowed, sometimes to the depth of four or five feet; and then the area of the whole loch appeared as one uninterrupted sheet of water.

On such occasions the area of the Barr Loch was covered to the depth of from six to nine feet; while during a part of every summer it was so shallow as to produce a luxuriant vegetation, which, however, by the frequent inundations to which it was exposed, was generally rendered of little value, and often entirely destroyed.

It may here be proper to mention, that two attempts had formerly been made to drain the whole of Lochwinnoch Loch, by deepening the outlet. The first of these was made above a century ago, and the last about sixty years since, by the proprietors of Castlesemple. They were attended with great expence, as the River Cart, for a considerable distance from the loch, was almost on a dead level. By deepening the River Cart, however, the waters of the loch were lowered very considerably, and rendered so shallow, that only a very small part of it remained uncovered by vegetation; but the beauty of the lake was destroyed, while little profit could be derived from the remnant of a crop frequently inundated by the sudden influx of the river waters.

The late William Macdowall of Garthland, a man not less noted for his correct taste in matters of rural ornament, than for his judgment in useful improvements, succeeded to the property when in this condition; and having determined on adding to the beauty of his residence at Castlesemple, by deepening that part of the loch opposite to his house, he cut a considerable part of it to a greater depth, and formed a sloping bank and several ornamental islands out of the materials. To restore still farther the character of a lake, he run across the River Cart a damhead of near four feet in height, which had the effect of deepening the lower part of the Loch of Castlesemple to that extent, and had also some effect on the Barr Loch, although in a less degree. In order to improve the drainage, as it affected the Barr Loch, Mr Macdowal cut a main drain through the centre of it, and several lateral drains; but from its continual exposure to the overflow of the waters which fell into all parts of the loch, these drains were of no avail in times of flood, when the whole was completely overflowed, and the crop of hay rendered of so little value, that the whole subject of the drainage of Barr Loch has been let so low as L. 15 per annum.

In the year 1800, the writer of this account made out a memorial for Mr Macdowal of Garthland, suggesting two plans; the one for draining the whole of Castlesemple and Barr Lochs, and the other for draining Barr Loch only.

As the first of these plans has not been executed, it does not fall to be here detailed.

The second plan, viz. that for more effectually draining the Barr Loch alone, comprised two operations: The first was to run an embankment quite round it, so as to exclude effectually the whole river waters, and also the adjoining waters of Castlesemple Loch; and the second was, to get quit of the spring waters which might arise, and the rain water which should fall within the area of the embankment.

A few years after this plan was suggested, Mr Macdowal carried the first part of it into effect, by making an embankment round the Barr Loch; by which means a considerable improvement was made, for although the lands remained wet, and part of them too deep in water to produce any profitable crop, yet a part of the grass was thereby saved from river-floods, and considerable crops of hay were preserved.

The writer does not know exactly the produce of crop, nor expence of management of the Barr Loch, while in this state; but he has been informed that the gross rental amounted to about L. 300 yearly.

The most important part of the operation, however, remained yet to be performed, and, with the view of accomplishing it, the writer hereof, in 1813, purchased the whole Barr Loch, with about 100 acres of the upper end of Castlesemple Loch. His entry was at Martinmas 1813, and in that year he made preparations for the drainage, which was commenced early in 1814. His first object was to secure and improve the embankments already made, which in many places were insufficient and imperfect. The waters from Kilbarnie Loch, and other streams from the south, were carried round the south side of the loch by a canal 28 feet broad, which being cut in a clay soil, and the materials placed on the inside, formed a very strong bank, although not of sufficient height. It was, however, of more than sufficient breadth, being 36 feet at the base, and 10 or 12 feet on the top; and in order to raise it to the requisite height, and at the same time to form a road, the inside was cut out and placed on the top of the bank, thereby raising it to one uniform height, with a slope of 45° on each side, and leaving a roadway about 18 feet clear; the banks were strengthened, repaired, and made of equal height all round. The embankment on the north side of the loch being of a sandy texture, and having had no puddle-wall in the centre, was opened up to the bottom wherever the water was found to pass, and a puddle-bank of clay inserted, three feet wide at the bottom, and decreasing to two feet at the top. In some places considerable difficulty was experienced in getting to the bottom of the sand-bed, so as to prevent the water from passing under the bank; and in such places a drain was cut on the inside of the bank, and the water carried off by one of the lateral drains; and sometimes pumps were used till the sand-bed was cut through, and then filled up to the surface, and joined to the other puddle within the bank, as represented in Plate VI. fig. 3. A, B, B, C, C, C.

The old bank being thus secured, it still remained to bring up a level by a drain, so as to carry off the spring and rain water from the land within the embankment, to such a depth as to dry the surface. Considerable difficulty occurred in the execution of this drainage, from the situation of Castlesemple Loch, which was interposed between the Barr Loch and the River Cart, where the nearest fall could be obtained. This fall was caused partly by the interruption of a rock across the river, but chiefly by the dam-head before-mentioned.

The drain was therefore begun below this dam-head, and being cut to the depth of the bottom of the river, was carried forward on the same level, and cut to the width of six feet, so as to leave space for a wall of eighteen inches thick on each side, and a free space of three feet for the water. The side-walls were built of freestone to the height of four feet, and then arched over, so as to give a height of nearly a foot more, leaving a free space of three feet wide, and five feet in height for the drain.

This drain was cut to the depth of about twelve feet from the surface, and, in executing it, the mason-work followed close after the excavation; for whenever the workmen had cut out five or six yards to the level, the masons immediately commenced and finished that space; after which a similar distance was again cut out, and wheeled on the top of the last-formed arch; and thus the work proceeded. The levels having been ascertained all along the line, and a section made, the work was set out in lots to different contractors, and an overseer attended constantly to see that the cuttings were made down to the level, and of the proper breadth, and the mason-work properly executed. From A to B, Plate VI. fig. 1., a distance of six hundred and eighty-four yards, there was little variation in the nature of the work. The material cut through was earth or clay; the drain was carried on at a distance of about twenty-five feet from the River Cart; and only at one place a sand-bed into the river gave any interruption. This stratum of sand brought the water from the river into the drain, and it was found necessary to insert a deep puddle-dike across the sand-bed, between the drain and the river, which had the effect of cutting off the communication, and stopping the influx of water.

At B it was necessary to conduct the drain under a stream of water about ten feet broad; and this was effected by a wooden-tunnel, made of three-inch larch plank, three feet deep, and three feet wide, which passed the stream six feet on each side, and was secured by puddle all round till it entered the masonry; and the puddle, again, was protected from the river by a stone and lime wall, extending several feet on every side, beyond the puddle, and along the sides of the river.

From B to C, a distance of eight hundred and forty yards, opposite the house of Castlesemple, the ground, being in view of the house, had been laid down smooth and ornamental. In forming this ground, many inequalities and water-tracks had been filled up, and some quick-sands occurred, so that it was found extremely difficult to keep the drain open until the mason-work could be formed. For this purpose a close frame-work of plank was used, supported by cross bars, and turf driven in behind, together with the soft materials scooped out from the centre, till the requisite depth was obtained; but it was sometimes necessary to place a layer of plank in the bottom, to remain there, and then a bed of puddle of clay, and thereon to begin the masonry, which on all this space of eight hundred and forty yards was made of an elliptical form, four and a-half feet high by three feet wide, and entirely built of good freestone, set in lime mortar, having a puddle inserted at the sides when that was found necessary. The whole of this space from B to C being completed, it was covered with a puddle-bed of two feet deep, and from six to eight feet wide, inserted on each side into the soil, and the whole covered smooth with turf, so as to correspond with the contiguous grounds. This last puddle-bed was necessary to protect the drain from the water of the loch, which sometimes overflowed this ground to a considerable depth.

The whole of the covered drain (which begins at A, and ends at C), had vertical shafts at the distance of eighty yards from each other, built three feet square to the surface, and covered with large paving-stones closely fitted, so as to be removable at pleasure, whereby access was left for cleaning out or repairing the drain. From B to C these covers had also a layer of puddle and turf, and their situation was marked out by a small fixed stone.

From C to D is an open drain, cut out of the solid ground, partly freestone, and partly slate-clay, and it is cut all along at such a distance from the loch, as to afford sufficient materials for its own protection. It is formed five feet wide at the bottom, and with a slope of 45°, except where freestone occurs, in which case it is left nearly perpendicular. It was found necessary to give the outside of the embankment, towards the loch, a slope of about 15°, and to cover it with loose stones, in order to prevent the effect of the waves; and this, with occasional attention, is found sufficient.

At D is a self-acting sluice, placed against the underside of a cross drain, composed of an arch twelve feet long, with an opening of three feet wide, and four feet high, having a wall of stone and lime at each end, secured by puddle in the centre, and raised to the height of the embankment, so as to prevent any accident by a breach in the embankment along the loch, the valve-sluice shutting whenever the water below the sluice rises higher than the water above it.

From D to E the drain is continued of the same dimensions; but from E to F it is considerably wider, and the ground is so soft, that it was found necessary to cut the drain at a considerable distance from the bank; the weight of the bank having been found to press out the ground between the bank and the drain, so as to fill up the drain, and sink the bank until this precaution was adopted. The bank being curved, and the drain straight, the distance between them varies from ten to thirty yards. The bank has been partly formed out of the earth, cut from the drain, but the greatest part of the material has been taken from the north side; and at no place was ground broken on that side at less than thirty yards from the bank, so as not to impair its solidity; but even this precaution, in some places, was insufficient, and it was found necessary in one place, for about sixty yards, to drive a double row of piles on each side of the place intended for the site of the bank, to the depth of from twenty-five to thirty feet, and to fasten their tops together with some cross pieces of timber, before the bank could be formed; and by placing layers of turf with the earth of which the bank was composed, a solid mass was at length obtained. The slope of this bank on the inside was made about 18°, and the outside 11° 18′, or nearly five of horizontal to one of perpendicular. The outside was immediately covered with turf carefully jointed, and each turf fastened down with a stake of young willow, about two feet long, and from one to two inches in diameter, inserted nearly to the surface, and intended to grow and protect the bank from the action of the water. This was done at all times during the summer, and most of the willows grew, and have answered the purpose for which they were intended.

From F to G is a tunnel for conducting the water generated within the Barr Loch embankment into the open drain. It passes under the canal HH, which conducts the water of Kilburnie Loch into the open part of Lochwinnoch Loch, and also under the private road, and the public road. So far as it passes under the roads, it is conducted in mason-work; but under the canal it is conducted in a tunnel of three-inch larch plank, well pitched and set in puddle; it is also puddled over the top, and protected by pavement. The dimensions of the wooden tunnel are six feet in width, and two feet in depth. It is supported by a middle division, and within the upper end of it are inserted three sluices, which are raised or lowered from the top of the bank by screws one and three quarter inch in diameter, working in the framework of the sluices placed within the bank.

The canal from I to K discharges the waters collected within the embankment into this tunnel. It was formed by deepening the old canal to the new level; and side drains were cut, dividing the land into lots, as shewn on the plan. The centre drain is about twenty feet wide at the top, and fourteen feet wide at the bottom; it is run nearly on a dead level; and as the land gradually rises towards the upper part of the loch, about three feet higher than the under part of it, the depth increases in the same proportion.

At the head of this canal there is a tunnel, with a set of sluices, for the purpose of introducing the waters of Kilburnie Loch within the bank; so that by opening these, and shutting the sluices at G, the whole might be covered with water at pleasure, and the process of *warping* executed. This process has not yet been attempted, for the soil is still of a richness that renders manuring unnecessary.

The side drains are cut on the level of the middle drain; they are eighteen inches wide at bottom, sloped rather steeper than an angle of 45°; and increase in width at the top as they increase in depth. They are in general from four to six feet in width at the top, and a margin of grass is left along each side, of a foot in breadth, to prevent the soil from falling into the drain.

The whole waters collected within the Barr Loch embankment being thus carried away on the level of the River Cart, below the damhead at A (except the fall necessary for giving it motion) the waters within the embankments stood nearly three feet six inches on a lower level than the waters without the embankment, and standing all the way from six to eight inches in depth of water, the smallest possible declivity carry them off. It being necessary to prevent any accession of water to the lower drain, and to preserve it from all water flowing from the surrounding grounds, a catch-water drain was formed; this drain is delineated by the double-dotted line *a*, *b*, *c*, *d*, *e*, *f*, *g*.

From the various inclinations of the surface, it was necessary that the waters should be conducted to different points, and discharged in different places into Castlesemple Loch. At *b* is a conduit made of strong plank, bound with iron, jointed with white lead and oil, and pitched over, having an aperture of about sixteen inches square for conducting water over the canal and bank, and delivering it into the lake. The water collected on the grounds on the upper side of the canal, from *a*, the extremity of this drain on the east to *c*, and conducted by the fall given to the drain to the point *b*, flows into the loch by this conduit. In like manner the conduit at *d* receives the water collected between *c* and *e*, and the conduit at *f* receives and transmits the water collected from *e* to *g*. At *g* there is a height in the surface of the grounds, and the water flows from that point by *i*, below the public road, and is delivered into the canal which surrounds the Barr Loch, and thence into Castlesemple Loch.

This catch-water drain varies in its dimensions, according to the quantity of water found necessary to be carried off. It is simply a well-sloped open drain, having the materials formed into a small bank on the lower side, well rounded off, with a puddle-wall in the centre, where that appeared necessary. The conduits are conducted through the bank after passing the canal near the top of the bank; so that the loch waters may not flow back through them in times of high flood.

The whole of this drainage, and the embankments below the Barr Loch, were executed during the season of 1814. The whole work was done by contract. About two-thirds of the excavations were executed by Irishmen, and the remainder by Scotsmen, except what was done by ten Englishmen from Lincolnshire, who used the narrow wooden spades common in that country, and threw the soft earth right over their shoulders to a considerable height and distance, which, in some cases, made the operation of forming the bank more easy than by wheeling the earth on planks by barrows, as was done by the other contractors.

The cutting of the covered drain at the lower end from A to B, was contracted for, in general, at about sixpence per cubic yard, reckoning it at two yards in width, which was all that was necessary, although it might happen to be actually cut wider. The stones and other materials for the mason-work were brought down the loch in lighters provided for the purpose. The mason-work was contracted for at from L. 2 to L. 2, 10s. per rood, including the arches, according to the difficulty of the particular lots; and the levelling up of the surface, with other extra work, was done by special estimates. Where the ground was soft, the general price for cutting and wheeling the first forty yards was 4d. per cubic yard; and an additional penny for every twenty yards beyond forty; the contractor cutting out the material, so as to form the drain to the dimensions of wooden frames, provided for the purpose, and forming at the same time the bank by other frames, to regulate its shape and dimensions. The perpendicular height of the banks above the inner drains was in general eleven feet, and above the water on the outside seven feet six inches. When the materials were hard, there was no need of wheeling to an extra distance; and the general price for cutting and wheeling, and forming the bank, was sixpence per cubic yard, and in some instances, where the material was very hard, as high as a shilling.

	Yards.
The length of the covered drain is	1752
of the open drain, and bank below the public road,	2541
of the catch-water drain, ...	2590
of the middle drain of Barr Loch, . . .	1776
of the side drains communicating therewith, .	5673
of the drain and bank round Barr Loch, .	4563

The total cost of the drainage and embankment made in

1814, and some additional finishing and repairs in 1815, was nearly L. 7000.

It is not known what the previous embankment cost, but it is supposed to have been nearly L. 3000.

After the drains were completed, the whole grounds within the embankments were dug over, and cropped with oats in 1816, 1817 and 1818. About sixty acres of the embanked grounds were afterwards ploughed, and part of them green cropped, and sown down with rye-grass, soft grass and timothy, and the remainder done with spade-work. Since that time a part of the ground has been cut in hay; the greatest part of the grounds, however, is left to the natural grasses, and was never sown down.

The whole drained lands within the banks consist of two hundred and thirty Scots acres, of which, in the Barr Loch grounds, 169 acres have been under crop, and about eight acres are occupied by roads and drains. The other part of the drained lands, on the east of the public road, has been cropped to the extent of forty-eight acres; and the remainder, of about five acres, is occupied by drains and roads.

The corn-land has generally been sown by the proprietor, and sold off before reaping. The expense of digging and clearing the furrows costs from 35s. to 40s. per acre, and the expence of seed, and hoeing in the seed, may average 25s.; so that the total expense may be reckoned at 65s. per acre.

The produce of 1826 and 1827, as sold by public roup, may be taken as an average.

Produce of 1826.

Barr Loch ground in oats, 44 acres and 13 falls, .	L. 681	16	8
Deduct seed and labour, ...	132	5	3
	L. 549	11	5
123 acres 3 roods and 28 falls in hay, ...	984	5	8
Carried forward,	L. 1533	17	1

Brought forward,				L. 1533	17	1
Produce of embanked grounds below the Lochbridge, not exactly known, but proportioned as in crop 1827, is				263	17	0
Free rent of 1826,				L. 1797	14	1

Produce of 1827.

Barr Loch grounds in oats, 56 acres 1 rood and 30 falls,	L. 337	13	6			
Deduct seed and labour,	183	8	5			
Produce of embanked ground in hay, 111 acres 2 roods 15 falls,	709	4	1			
	L. 863	9	2			
Embanked ground below the Lochbridge, 48 acres and 23 falls, let for	165	15	8			
				L. 1029	4	10
One-half,				L. 2826	18	11
Average free rental,				L. 1413	9	5½
The original rent of the Barr Loch grounds now within the banks, may have varied from L. 15 to L. 25; and the embanked grounds on the east side of the road from L. 12 to L. 20;* so that the average of these aggregate rents may be taken at				36	0	0
Annual improvement by the drainage,				L. 1377	9	5½

If, therefore, the cost be taken at L. 10,000, the improvement yields somewhat more than 13 per cent.

It was believed that a field of coal lay under the lands drained, on the east of the public road; and indeed the coal has been wrought to some extent, but whether the work can be profitably continued, is somewhat problematical.

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* The Barr Loch grounds above estimated, are only those within the embankments, and not the whole Barr Loch lands, which consisted of two hundred and five acres, seventeen acres of which were good arable land, and about twelve acres were planted. The lands within the banks consist of those only which were formerly under water. This is mentioned to explain the lowness of the rent these subjects formerly yielded.

AN ACCOUNT OF THE MODE OF DRAINING, BY MEANS OF TILES, AS PRACTISED ON THE ESTATE OF NETHERBY, IN CUMBERLAND, THE PROPERTY OF SIR JAMES GRAHAM, BART. M. P.

Communicated by JOHN YULE, *Esq. Glingerbank.*

THE estate of Netherby, belonging to Sir James Graham, Bart. M. P. for Cumberland, is situated at the north-east angle of the county of Cumberland, and is bounded on the north, for sixteen miles, by Scotland. In the year 1819, when the management came into the hands of the present worthy and public spirited proprietor, many improvements were found absolutely necessary to be carried into execution, before the numerous farms of the estate could be let to advantage, or before an improved mode of husbandry could be introduced with effect into the district. Among other improvements, that of draining was found to be particularly necessary; for before that period little or almost no close draining, had ever been attempted on this estate, or its near neighbourhood, on the English side of the border. Indeed, the general want of stone for draining, and of quarries, where materials might be procured at a moderate rate, must have contributed much to retard this primary improvement, for, excepting one or two places on the Liddell and Lyne, where the red sandstone made its appearance, no quarries existed, and even these were at such a distance from the general situation where drainage was necessary, that the expense of carriage alone precluded all idea of ever effecting a complete drainage of the estate, by means of stone. The river Esk, which runs through a great part of the centre of the estate, and the Lyne, which bounds it on the south, afforded little or no material that could profitably be applied to a general drainage on a large scale. The appearance of the country, for six or seven miles eastward from the head of the Solway Firth, is flat, with declivity enough, in every case, to discharge water from its surface: Farther back the surface rises in gentle swells, having, in some places, steep banks. In the vale of Esk, the soil is generally what is termed a sandy loam, of very excellent quality, fit for the most improved turnip husbandry, and carrying large crops of wheat and barley, all incumbent on a porous subsoil. On the river Lyne the soil is generally more stiff; and one or two large farms there consist of the very best quality of strong clay soil, fit for beans and wheat, on a retentive subsoil. As the country rises from the beds of these rivers, the general run is either a kindly light turnip and barley soil, a poor weeping clay, or a black moss-topped, or peaty soil; but all varieties are in general incumbent on a subsoil of stiff clay, and have been subjected to the plough for many years. In this district, at the period mentioned, there was the greatest possible need of drainage, for by far the greatest portion of the country was surcharged by spring and surface water.

Such being the situation of the estate, it became a matter of grave consideration how an extensive drainage was to be effected, without the usual means of stones, except at an enormous expense.

In visiting his uncle, William Ing, Esq. of Thorpe, in Staffordshire, Sir James Graham discovered that, under somewhat similar circumstances, Mr Ing had improved his estates in a very high degree, by draining with tiles. Sir James having communicated with his agent on the subject, no time was lost in procuring a proper person from the neighbourhood of Tamworth, in Staffordshire, recommended by Mr Ing, for the purpose of examining the estate of Netherby, to discover if proper clay could be found for making tiles. The report of this person, after a careful survey, having been favourable, a contract was entered into with him for the manufacture of good draining tiles for the use of the estate. A proper tile-kiln, shed, &c. were erected, and the whole process was in active operation in the season of 1821. The engagement with the Staffordshire tile-burner lasted for three seasons, and, as may well be supposed, was attended with considerable expense. Care, however, had been taken to supply him with expert young men as assistants, natives of the estate; and these men readily learned the art of preparing and burning the tiles; and, at this moment, the whole draining-tiles required (upwards of two hundred and six thousand yearly, equal to about forty miles of drain) are supplied by a native of the estate of Netherby.

At the first beginning to drain with tiles, a certain degree of suspicion existed, that they might not fully answer the end in view; and before entering into any engagement with the tenants, it was considered proper, in the first place, that trials on a large scale should be made by Sir James at his own expense, upon several farms at that time in his own hands, and upon the extensive domain around the Hall of Netherby, almost every part of which required draining. The success attending the drainage executed at Sir James's own expense, was most complete and satisfactory. The farmers were then taken bound in their new leases to drain all the wet lands of their various possessions, within a given number of years, on being allowed draining-tiles *gratis* by the proprietor, and executing the drainage to the satisfaction of the agent of the estate. The natural prejudice against this new method existed but for a short time, for nothing repays the expense incurred sooner and better than draining well executed, and after the first season, a great demand took place for the tiles: indeed, at this time, it is found a matter of most serious difficulty to supply the tenants with the quantities they require. Thus, in a few years, some thousands of acres of otherwise unproductive soil, have been rendered perfectly dry, and fit for every operation of husbandry, and the natural and obvious result has followed, in the greatest possible improvement having taken place in the rural economy of the estate. In a short time, therefore, in every probability, this extensive and valuable estate, once one of the most neglected, will be one of the best managed in any country, and at a moderate expense, so far as draining is necessary, fairly and equally borne by the proprietor and tenant.

Having thus given a general sketch of the introduction of draining by tiles, into the husbandry of the Netherby estate, it becomes necessary to give an account of the mode of manufacturing the tiles, the method of cutting and finishing the drains, and lastly, of the expense of draining by this method.

Account of the Mode of Burning Tiles, &c.

The clay most suitable for draining-tiles, is of the same description and quality commonly used for the coarser kinds of pottery purposes, such as the making of house-tiles, jars, &c. The clay used at Netherby lies close to the surface or top soil; the bed is about five feet thick; it is what workmen call *keen* clay, and is quite free of small stones, or any mixture, in its native state.

The clay necessary for the supply of the ensuing season is always turned over about the preceding Martinmas, in order that it may receive the benefit of the atmosphere through winter. In the spring, so soon as the frosts are gone, the process of tempering commences, which is done with the greatest care, either by a simple grinding machine, driven by a poney, or by manual labour. Moulding the various sizes of tiles, in which a small proportion of sharp river sand is necessary, then takes place. Four moulders are commonly employed, each attended by a stout boy, for bringing him the tempered clay in lumps, and removing the moulded tiles. The table on which the tiles are moulded is about four feet long, and two feet broad, furnished with sand and water boxes. Two moulds are necessary for each tile; the first, a square (See fig. 1.), contains the superficial tile before being rounded;

the second (fig. 2.) is used for forming the tile into the proper shape. A clay-cutter is also necessary (fig. 3.), the bow of which is a strong hoop bent, the string a piece of strong wire.

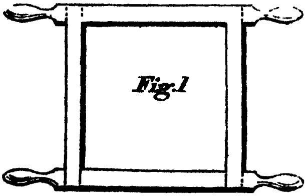


Fig.1

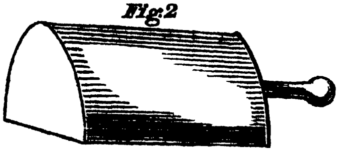


Fig.2

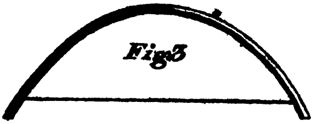


Fig.3

Each description of tile requires its various moulds. The best shape of draining-tiles is that represented by Fig. 4.

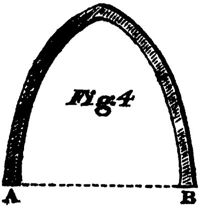


Fig.4

The size is measured of the open at the bottom of the tile from A to B. An expert moulder will mould in a day either 1000 three-inch tiles; 900 four-inch do.; 800 six-inch do.; 300 eight-inch do.; or from 2500 to 3000 building bricks.

The wages to a good moulder is from 3s. to 3s. 4d. per day in summer, and his assistant has generally 10d. or 1s. per day, without ale or victuals. The tiles are carefully and neatly arranged in layers, crossing each other, and divided by thin pieces of wood, in an open shed to dry, and, when dried sufficiently, are consigned to the tile kiln, and there properly arranged on end, for the purpose of being burnt. It is necessary to have a quantity of building bricks in each kiln, for the purpose of settling the flues. These bricks are moulded and dried in the usual way. The Netherby kiln contains about 9800 draining tiles of various kinds, and about 2000 bricks. Each kiln requires from 180 to 200 imperial bushels of coals to burn the whole. The burning process requires the most watchful attention day and night, so as to keep regular fires and heat in all parts of the kiln. The process of burning generally takes about three days, and two or three days more are requisite before drawing, in order to allow the kiln to cool. The tiles pay no duty to Government, and are not glazed.

The establishment for this manufacture at Netherby, consists of a kiln 21½ feet long by 15 feet wide, over walls, and 11 feet high, with five furnaces on each side, sunk about four feet under the common level of the surrounding ground, open at both ends and top, and built of bricks. The walls diminish in thickness from 2 feet 9 inches at the bottom, to 18 inches thick at the top. There is a drying shed, 135 feet long, and 20 feet wide, open all around for four feet high, supported on strong wooden posts, and covered with thatch; and around these erections are the floors for moulding, &c. Were it necessary to rebuild these erections, it is possible the construction and arrangement might be considerably improved, particularly in the kiln.

The agreement with the Netherby tile-burner is this:— He gets a good cottage and garden rent free, and the use of the tools, moulds, &c. belonging to the kiln, all which, together with the premises, he is bound to keep and leave in good order. He prepares the clay, provides the coal, and every thing else necessary, at his own expense, and he furnishes Sir James Graham with the best made draining-tiles and bricks, at the following prices, which are in full of every thing whatever :—

Three-inch tiles, per thousand,			£1	4	0
Four-inch	do.	do.	1	8	0
Six-inch	do.	do.	1	17	0
Eight-inch	do.	do.	3	0	0
Building bricks, per thousand, Excise count, and the contractor paying the duty,			0	19	0

The prices paid for tiles at the sale-kilns of the neighbourhood of Carlisle and Wigton, where they are now very extensively used by many intelligent agriculturists of the first respectability, are generally as follows :

Three-inch tiles, per thousand,			£2	2	0
Four-inch	do.	do.	2	12	0
Six-inch	do.	do.	4	4	0
Eight-inch	do.	do.	8	8	0

(N. B.—These tiles are each 18 inches long.)

Building bricks, per thousand, Excise count,	1	5	0

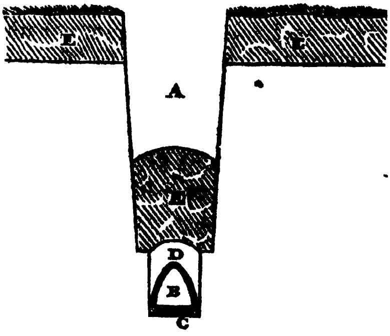
It will be seen from these statements, that the proprietor of Netherby is a gainer to a considerable amount, by manufacturing his own draining tiles.

Cutting and finishing the Drains.

In laying out the lines of drains, where springs are intended to be cut off, the same system practised by scientific and experienced drainers, who use stone, is followed for draining by tile. Where the removal of surface-water is the object in view, the natural inequalities, or indentations, in the surface are carefully examined, so as to attain the object with as few drains, and with as great effect, as possible. Where very stiff clay exists, a drain, even in every furrow, or division of ridges, has been resorted to with much effect, but this has seldom been necessary on this estate, although the expense is not so great as may appear at first sight.

In other cases, where the soil is of a damp retentive nature, such as the poor clays and peaty soils mentioned, where the surface is generally very flat and incumbent on a stiff clay, and no springs existing, main drains have been run in the lowest parts of the land to be drained, and smaller drains run into these, parallel to, and at stated distances from each other. This mode, when properly executed, answers the purpose in view remarkably well.

The manual operation of draining has been conducted in the following manner: The deepness has always been suited to the object in view; drains for springs in many cases have been very deep, so as to cut through the substratum containing the water, whether that has been gravel or sand; surface drainage from 2½ to 4½ feet deep. In all cases the drains are cut as narrow as a workman can conveniently work in them, decreasing in width as they approach the bottom. The tools used are the common Scots or English spade, shovel and pick, or the round-mouthed spades used in forming canals, &c., called here Navigation Spades. The drains being cut to the required depth, with all the top-soil laid on one side, and all the subsoil thrown out on the other side, a narrow-mouthed spade, (technically called a Spit) corresponding to the breadth of the tile to be used, is then introduced, and with this instrument a bed for the course of the tile is carefully and neatly excavated, the strictest attention being paid to preserve a fair equality in the bottom, and a regular descent for the water; while a very frequent use of the spirit-level is commonly necessary. This mode of draining will be more distinctly explained by the following sketch:



A, the drain, cut to any required depth; B the space for the draining tile; C a bit of slate or broken tile, on which the tiles rest at their joinings. (This is sometimes omitted, where the bottom is a very stiff clay). D, a clean cut green turf, the grass-side next the tile, and clapped carefully over it, to prevent the tile from receiving any damage. E E the surface soil, cut out of the top of the drain, generally of a porous nature, put above the turf. The remainder of the drain is filled up, if wished, by the subsoil excavated, or what is more general, this soil is spread on the adjoining ridges, and the sides of the drain are then sloped in by the spade. Straw, furze, or small brushwood are sometimes placed next the tiles, but a clean good turf is preferable. It has in some few cases been the practice at Netherby, when the drains happened to be very near the river, and carriage of course not expensive, immediately after the tiles were placed, to fill up the drain with the clean blue stones from the bed of the Esk, which are here very small, to as great a depth as was thought necessary, and then to finish off the drain in the usual way of closing stone-drains. This probably makes the best of all drains; but with tiles alone, the result has been most gratifying, on all the varieties of soils mentioned, where the drains are carefully executed. It has been customary here to use the auger in cases where the tapping of springs was thought necessary.

Expence of Tile Draining.

The rate of labour in this quarter of Cumberland is moderate. The very best labourer in summer has from 1s. 8d. to 2s., and in winter from 1s. 4d. to 1s. 6d. per day, without victuals or ale. The cost of cutting, laying the tiles, and finishing drains here, is generally thus: Drains 2½ to 4 feet deep, 4½d.; drains from 3 to 5½ feet deep, 6½d. per Cumberland rood of 7 yards or 21 feet. The length of the 3, 4 and 6 inch tiles is for each one foot. The eight-inch tiles are 18 inches long; a single-horse cart carries with the greatest ease 250 tiles of various sorts, or nearly 12 roods; so that from this data, and the expense of the tiles given at page 394, the real cost of draining by tiles may be accurately known. The following calculations may, however, help to elucidate this important part of the subject.

I. *Expense of Draining by Three-inch Tiles.*

	Per Rood of 21 Feet		
Cutting the drain, say on an average 2 feet 9 inches deep, laying the tiles on slate or refuse tile, cutting and laying a turf over the tile, reversing the surface-soil, and covering in,	L. 0	0	4
Tiles, 21 to the rood, say at the price paid at Netherby for three-inch tiles, 24s. per 1000,	0	0	6¼
Carriage of tiles, average distance 3 miles, 3 rakes of a horse and cart per day, a cart carrying 250, and at 5s. per day, horse and cart,	0	0	1¾
Refuse slate, or broken tile and carriage,	0	0	0½
Per rood,	L. 0	1	0½

II. *Draining by Four-inch Tiles.*

	Per Rood of 21 Feet.		
Cutting, say 4½ to 5 feet deep, laying tile and finishing, same way as the last,	L. 0	0	6
Tiles, 21 to the rood, at 28s. per 1000,	0	0	7¼
Carriage same as last,	0	0	1¾
Refuse slate, &c. and carriage,	0	0	0½
Per Rood,	L. 0	1	3½

III. *Draining by Six-inch Tiles.*

	Per Rood of 21 Feet.		
Cutting, say 4½ feet to 5 feet deep, laying tile and finishing, same way as two last cases,	L. 0	0	6
Tiles, 21 to the rood, at 37s. per 1000,	0	0	9¼
Carriage,	0	0	2
Refuse slate, &c. and carriage,	0	0	0½
Per Rood,	L. 0	1	5¾

If, however, tiles are to be purchased from a common tile kiln, where they are made for sale, the expence would be thus: Drains by three-inch tiles 1s. 4¼d. per rood; drains by four-inch tiles 1s. 9½d. per rood, and drains by six-inch tiles 2s. 6d. per rood finished.

The three-inch tiles are decidedly the most useful for ordinary purposes. The four-inch tiles are able to discharge a very considerable quantity of water. The six-inch tiles, unless the spring is very strong, or the drains of great length, are not so much used as the two last sorts. Eight-inch tiles are seldom or never necessary, unless in very particular situations.

A very large kind of tiles for conduits at gates, &c. are sometimes made, but are not considered good for the purpose.

From the above estimates, which are strictly correct in practice, it would appear, that, even supposing tiles are to be carried to the field to be drained, a distance of three miles, or even more, and that a stone-quarry existed in the field itself, the drainage by means of tiles is by far the cheapest mode, and if well executed, may probably prove equally effective as if done by stone; while the known fact that good tiles do not perish in drains, (whether these drains may be constantly filled with water or not), ought not to be forgotten. It is not intended to assert that tile-draining is a new discovery, or that that system of draining, in point of durability, can be compared with stone-drains; for in fact tile-drains have been used for too short a period in the north, to allow the comparative merits of the two systems to be accurately determined; but the very great and obvious disproportion in the expense deserves serious consideration, and ought to have its due weight with unprejudiced minds. The writer of this article has no hesitation in stating, that tiles put in 8 or 9 years ago at Netherby, are running as well now as on the day they were finished, and that when there is occasion to lift any of these drains, the tiles are found to be in the same perfect state as when they came out of the kiln.

In Scotland, except in a few particular districts, there is generally no want of stones for draining purposes, and it may therefore be reasonably supposed, that draining by means of tiles may not soon become general (although the system is begun to gain ground in Ayrshire, and in the neighbourhood of Glasgow) unless public-spirited proprietors set the example to their tenantry, or the Highland Society of Scotland think the object deserving of their countenance and encouragement.

GLINGER BANK, LONGTOWN,
31*st* *March* 1829.

The system of tile-draining referred to by Mr Yule, as existing in Ayrshire, was introduced by the Duke of Portland, on whose estates it is very extensively practised. The tiles are manufactured on the property, and are furnished free of charge to the tenants, who, it is believed, pay interest on the further outlay. The drains consist of very shallow trenches, generally running parallel to each other. Whether the material employed be stone or tile, it will be seen that this species of draining differs entirely in principle from the system of Elkington, described so fully in a former Essay in the Society's Transactions. Mr Elkington separated wholly the practices of surface and under draining, conceiving them to have a different object, and to depend on different principles.[*] He formed the drains of a depth calculated to defend them from the injury to which shallow drains are exposed from mud carried into their cavities from the soil, and he employed the materials in such a manner as might preserve the permanency of the work But the main principle of his system was to intercept the water, ere it should be forced upwards to the soil, by reaching it in the lower strata of sand, gravel or other porous substances, in which it should be found to permeate. This system of draining may be justly termed scientific, as compared with all the others before in practice. Wherever it has been adopted, and the work properly executed, it is believed that the result has evinced the justness of the principle. It is doubtless more difficult in the execution than any system of shallow draining, requiring a more careful examination of causes, and a more skilful application of means. It is hence more difficult to be introduced into practice, and more subject to failure from the want of skill in the operator. But this is not an argument against its introduction into districts where it is not yet practised, but rather affords a reason for using increased means to extend the knowledge of it. In recently directing an essay on the subject to be inserted in their Transactions, the Society had in view the expediency of recommending this admirable system of draining to the notice of the landholders and tenantry of Scotland. The substitution of tiles for stones is not inconsistent with this doctrine, although, in practice, it is too frequently conjoined with the less perfect one. Stones abound in most parts of Scotland, and doubtless form a far more durable material for drains than the proposed substitute; but as cases may, and do often, occur, where stones are not to be obtained at a reasonable cost, the Society, desirous of giving publicity and encouragement to every other means, by which the important object of draining the arable lands of the country may be accomplished, have directed the insertion in their Transactions of the very distinct and judicious communication with which they have been favoured by Mr Yule.—Edit.

DESCRIPTION OF A BONE-MILL, THE PROPERTY OF MR ANDERSON, DUNDEE.

The efficacy, cheapness, and portable nature of bruised bones, have of late years in a particular manner directed the attention of agriculturists in Scotland to this species of manure, and have led to the construction of powerful machines for the purpose of bruising or pulverizing bones. Mr James Anderson of Dundee has erected a machine of this kind, which appears to be deserving of great attention. It is worked by a steam-engine of twelve horse power, and is in constant employment for supplying the districts adjacent. An elegant model in metal of the machine, along with a drawing, and specimens of the product, have been transmitted by Mr Anderson to the Highland Society, and a premium has been awarded to him, in testimony of the sense entertained of the merit of his machine, and of his own spirited exertions.

The bones to be ground are conveyed from the mill-floor to the upper part of the machinery, by a series of buckets, attached to a double chain. They are discharged upon a sheet of canvas, extending over two revolving rollers, by the motion of which they are conveyed to two cast-iron rollers, to which are fixed concentric rings of malleable iron, with teeth so as to present a serrated edge. The bones are thus partially bruised, and fall down upon a similar pair of rollers, but with the rings and teeth more closely set. Immediately underneath this second pair of rollers is a riddle, kept in motion by a crank. The bones which have been completely ground fall through the riddle, and are received into a small division or apartment beneath. The rougher bones, or those which are only partially ground, and have not fallen through, are conveyed by the motion of the riddle to a third pair of rollers, formed like those above, but with the rings and teeth still more close. Immediately underneath these last rollers, is placed a second riddle, kept in motion like the other, through which the bone-dust falls directly into the division below formed to receive it, while any of the bones not sufficiently ground to pass through the riddle, are carried forward by its motion into another apartment or division, from which they are either taken to be sold in their rough state, or are conveyed up by the buckets as before, to pass again through the machinery.

Figure 1. Plate VII. represents a vertical section of the principal parts of the machinery:

E, the chains with the buckets attached, by which the bones are elevated.

F, the sheet of canvas by which they are conveyed to the first pair of rollers LL.

MM, the second pair of rollers on which the bones fall.

T, the riddle upon which the bones fall after having passed between the rollers last mentioned.

G, the apartment or division into which the bone-dust falls.

NN, the third series of rollers, to which the larger or more partially bruised bones are conveyed by the motion of the riddle.

U, the riddle underneath, on which the ground bones fall.

H, the apartment or division into which the ground bones fall, after having passed between a third series of rollers.

I, the apartment into which the larger and partially ground bones are conveyed by the motion of the riddle *.

Figure 2. represents a front view of the mill, which is connected with the steam-engine by the spur-wheel and pinion BA. GDE are spur-wheels connecting all the rollers. LMN represent a front view of the rollers; and LL in Fig. 3. represent a view of the upper pair of them, as seen from above.

The journal brasses of the rollers are secured with bolts

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* In the model, the ground bones, as they descend from the second and third series of rollers, are received, not into distinct apartments, but upon a sheet of canvas, by means of which they are conveyed away, while the rougher or partially bruised bones from the third series of rollers, fall into an inclined trough, by which they are conveyed to a side. The canvas is employed when the bone-dust is not required for immediate sale, but when it is necessary to convey it away from the mill, to be stored up for future demand.

Fig 2

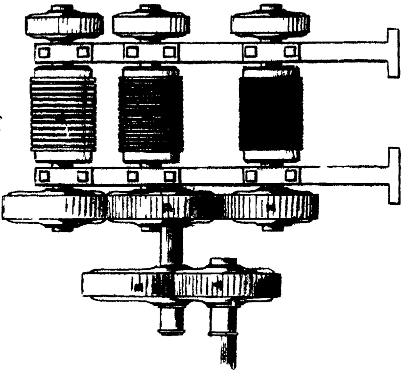


Fig 3

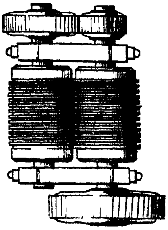
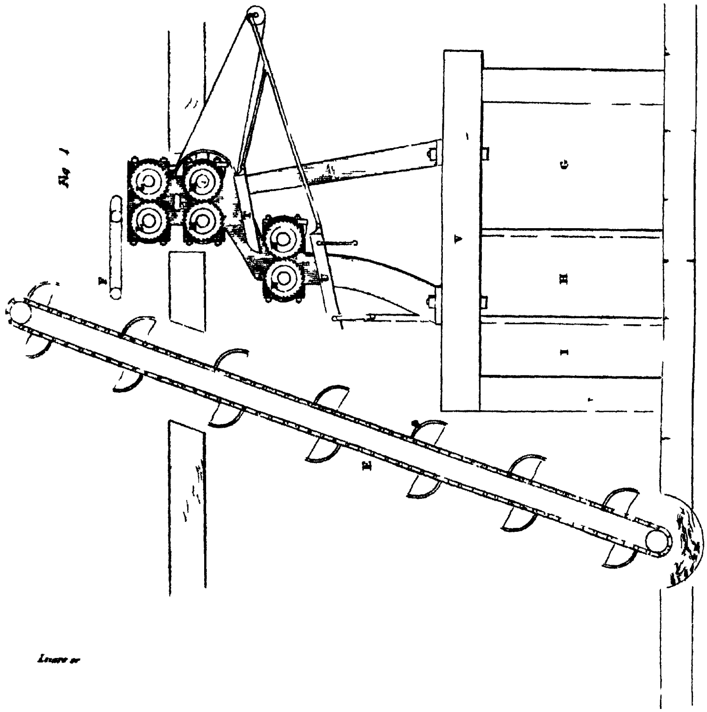


Fig 1



Lizars sc

and screws, in a strong frame of cast-iron, which is fixed on a platform of Memel timber, about 4½ feet above the lower floor of the mill. The shafts of the rollers are of malleable iron, 2 feet long between journals, and pass through the cast-iron cylinders, whose diameters are 9 inches. On these the cutters, as they may be termed, are screwed between two flanges, and keyed, so as to prevent longitudinal or rotatory motion. The cutters are malleable iron rings, whose interior and exterior diameters are 9 and 14 inches respectively, but the part into which the teeth are formed is steel, welded on the iron. The thickness of the teeth varies in the different rollers. Those on the first or breaking rollers are 1 inch thick; and the pitch of the cutters on one of the pairs is 1¾ inch, and on the other 1½ inch, the depth of the teeth being ¾ inch, and the number of cutters on each of the pair 12. The cutters on the second pair are ½ inch in thickness; and the pitch of the one is 1⅛ inch, and of the other ⅞ inch, the depth of the teeth being ¾ inch, and the number of cutters on each roller about 24. The cutters on the third or finishing set of rollers are ⅝ inch thick, and the pitch of the teeth on both rollers ⅝ inch, their depth being also ⅝ inch, and the number on each roller about 30. A malleable washer, or filler, of the same thickness as the cutter, but having the exterior diameter of course less than that of the cutter by the depth of the teeth, is placed between every cutter. The washers and cutters are accurately turned on the sides and edges, and bored so as to fit the cast-iron cylinder. The space of the cylinder occupied by the cutters, or length of its cutting surface, is 20 inches. The teeth are finished to the proper shape, and hardened to the requisite temper, and can easily be taken off the rollers to be sharpened or repaired. The motion is conveyed from the engine to the rollers by an intermediate shaft, and from the lower to the upper rollers by a train of cast-iron wheels, of great strength and accurate construction. The train on the principal or driving end is exhibited on the plan, Fig. 2.; and one of each pair of the rollers drives the other by a wheel and pinion on the opposite side. The wheel on the end of the intermediate shaft, which communicates the motion to the train of wheels which drive the rollers, and the wheel upon the top or breaking roller-shaft, are friction-wheels of the following construction. The teeth of the wheels are formed on a circular ring, which is turned so as to fit exactly on an interior ring. Six recesses are formed, into which brass blocks are fitted. Under each of these brass blocks are placed a pinching screw, which can be turned so as to make the blocks press on the exterior ring, with any requisite force. The use of these friction-wheels is,—when any solid undecayed bone, stone, or piece of metal, gets between the rollers, which might endanger the machinery, these wheels slide on the brasses, and set the rollers, while the engine continues to go.

The velocity of each pair of rollers is diminished from the lower to the upper series, and one of each pair goes about one-third faster than the other, so that the bones are retarded in their passage, and both cut and bruised as they pass between the rollers. Each pair of rollers has a set of malleable iron scrapers attached below, in order to clear the teeth of any animal matter which may adhere to them. The two riddles are driven by a crank, to which motion is communicated from the intermediate shaft by band-wheels and a band. On the pinion-axle of the undermost set of rollers is a series of band-wheels, that communicate motion to a similar set on the axle of the canvas roller next to the grinding rollers, which communicates motion to the canvas. And from this last mentioned roller, motion is also communicated to the uppermost roller of the buckets, and the buckets themselves, by means of a band and band-wheel.

The quantity ground by this machine is about 1½ ton of rough bones per hour, and nearly the whole are converted to dust.

PLATE [illegible]

Fig. 1.

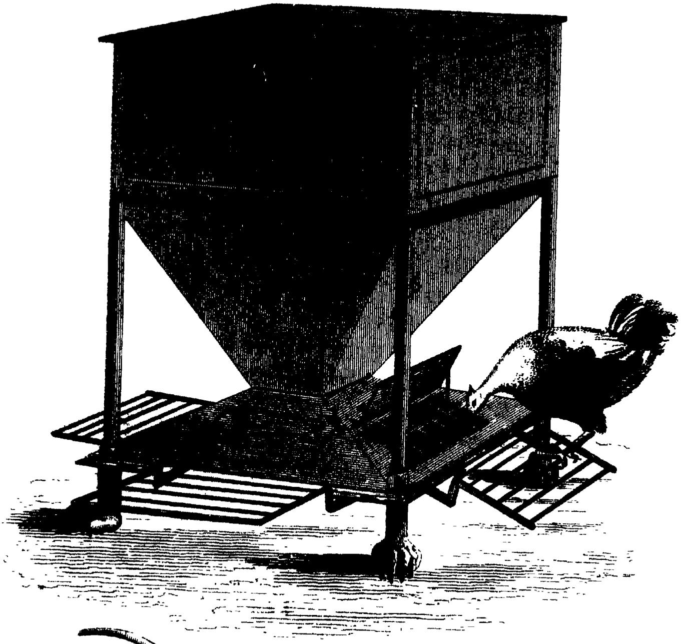
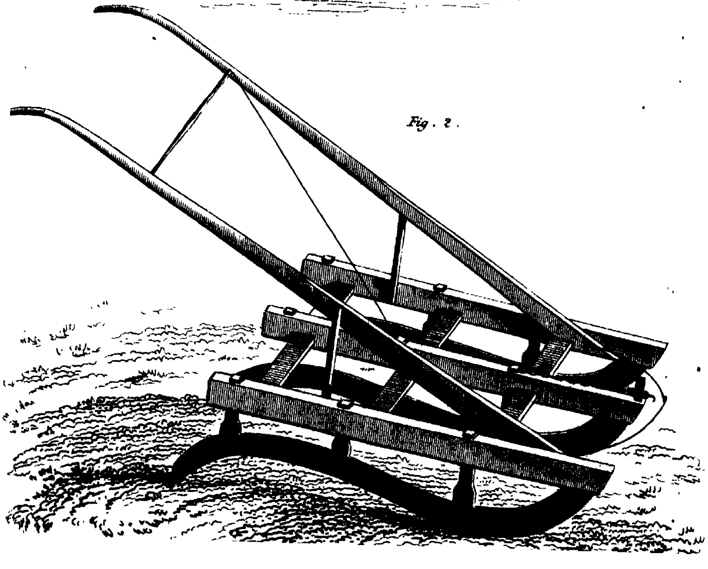


Fig. 2.



ACCOUNT OF AN IMPROVED [illegible] POULTRY FEEDER.

Economy is the great recommendation of this [illegible] feeder: It is made to hold half a quarter of grain, not one particle of which can be lost. When once filled, it requires no more trouble, as the grain falls down into the receiver below, as the fowls pick it away; and the covers on that, which are opened by perches, and the iron cover above, which is secured by a padlock, completely keep the grain from the rain, so that the fowls get it always quite dry, and as nothing less than the weight of a hen on a perch can lift a cover on the lower receiver, sparrows, and other small birds, are completely excluded, whilst the small cross bars through which the fowls pick, prevent cattle and other large animals from getting at the grain. It is astonishing with what facility the fowls learn to leap upon the perch, and so open the cover of the receiver which covers the grain.

ACCOUNT OF A MACHINE FOR CROSS-CUTTING NEW GROUND.

Invented by Mr Andrew Brown, Tenant in Carrabus, Island of Islay. Plate VIII. fig. 2.

Mr Brown having been employed for a considerable portion of his life in bringing rough mossy and heathy land into a state of cultivation, always found the greatest difficulty in reducing the soil to a state fit for receiving the seed, the sward being so tough that the plough, instead of making its way through it, carried the furrows before it, and was perpetually liable to be thrown out. This difficulty induced him to try various methods, none of which have proved so effectual, cheap, or expeditious, as the use of a machine of very simple construction, for cross-cutting the furrows, a model of which he has transmitted to the Society. See Plate VIII. fig. 2. With the assistance of this machine, the ground, however rough, can be cross-ploughed with a pair of horses, immediately after receiving the first ploughing, and can thus, by one or two more ploughings and harrowings, be rendered fit for

LIST OF MEMBERS.

		Admitted
*	ARGYLE, His Grace George William, Duke of	1790
*	ATHOLL, His Grace John, Duke of, K. T.	1789
	AIRLY, The Right Hon. David, Earl of	1819
†	ABOYNE, Right Honourable George, Earl of, K. T.	1793
	ABERDEEN, The Right Hon. George, Earl of, K. T.	1805
†	ARBUTHNOT, The Right Hon. John, Viscount of	1803
†	ABERCROMBY, The Right Hon. George, Lord	1799
	ADAM, The Right Hon. William, Lord Chief Commissioner of the Jury Court	1816
	ARBUTHNOT, Colonel the Honourable Hugh, M. P.	1811
10	ABERCROMBY, The Hon. George Ralph, *younger of Tullibody*, M. P.	1825
	AGNEW, Sir Andrew, *of Lochnaw*, Bart.	1829
	ABERCROMBY, Sir George, *of Birkenbog*, Bart.	1796
	ANTROBUS, Sir Edmund, *of Rutherford*, Bart.	1829
	ARBUTHNOT, Sir William, Bart. *Edinburgh*	1804
	Abercromby, Robert, *younger of Birkenbog and Forglen*	1816
	Adair, John, *of Genoch*	1829
	Adam, Rear-Admiral Charles, *of Barns*	1829
	Adam, James, W. S.	1807
	Agnew, Colonel Vans. *of Sheuchan*	1829
20	Ainslie, Major-General George	1803
	Ainslie, P. B. *Liverpool*	1826
	Aitchison, James, *St Clement's Wells*	1822
	Aitchison, William, *of Drummore*	1809
	Aiton, Rev. John, Minister *of Dolphington*	1828
	Alexander, Claud, *of Ballamyle*	1810
	Alexander, Boyd, 3d son of Claud Alexander Esq. *of Ballamyle*	1823
	Alexander, W. Maxwell, *of Mossziel*, 22, *Upper Grosvenor Street, London*	1823

		Admitted
	Alison, William, *younger of Westfield*	1826
	Allan, John, *of Linkfield*	1824
30	Allan, Nicol, Manager of the Hercules Insurance Company	1812
	Allan, Thomas, *of Laurieston*, Banker, *Edinburgh*	1814
	Allardice, Robert Barclay, *of Urie*	1810
	Allen, James, Merchant, *Grangemouth*	1815
	Allen, Lieut. Col. James, *of Inchmartin*	1821
	Allen, John Lee, *of Errol*	1821
	Alston, Major James, *of Cluniemore*	1827
	Alston, John, Manufacturer, *Glasgow*	1827
	Alves, Archibald, *late of Springfield*	1797
	Anderson, Adam, LL.D. Rector of Perth Academy	1829
40	Anderson, Alex., late Agent at Inverness for Bank of Scotland	1823
	Anderson, David, *of Moredun*	1825
	Anderson, David, *of St Germains*	1829
	Anderson, George, *younger of Gladswood*	1827
	Anderson, James, Deputy Clerk of Justiciary,	1820
	Anderson, John, *of Candacraig*	1819
	Anderson, John, *of Gladswood*	1819
	Anderson, John, W. S.	1821
	Anderson, Samuel, Wine Merchant	1820
	Andrew, John, *Fettes Row, Edinburgh*	1829
50	Anstruther, Colonel Robert, *Moray Place, Edinburgh*	1799
	Anstruther, James, W. S.	1827
	Arbuthnot, Thomas, *of Meethall*	1829
	Ashworth, Thomas, *of Turton*, Secretary to the Manchester Agricultural Society	1828
	Auld, William, Soap Manufacturer, *Leith*	1821
	Ayton, John, *of Inchdairney*	1821
	Aytoun, Roger, *of Murieston*, W. S.	1820
	Aytoun, Roger, Banker, *Greenock*	1826

B

	BEDFORD, His Grace John, Duke of	1824
	BUCCLEUGH and QUEENSBERRY, His Grace Walter Francis, Duke of	1828
60	BUTE, The Most Noble John, Marquis of	1815
	BUCHAN, The Right Hon. Henry David, Earl of	1811
† §	BREADALBANE, The Right Hon. John, Earl of	1784
†	BLANTYRE, The Right Hon. Robert Walter, Lord	1807
	BELHAVEN & STENTON, The Right Hon. Robert, Lord	1815

		Admitted
	BEXLEY, The Right Hon. Nicholas, Lord, Hon. Mem.	1801
	BOYLE, Right Hon. David, Lord Justice-Clerk	1804
	BALGRAY, The Hon. Lord	1800
	BRUCE, Sir Michael, *of Scotstown and Stenhouse*, Bart.	1825
	BLAIR, Sir David Hunter, *of Brownhill*, Bart.	1801
70	BAIRD, Lieut.-Gen. Sir David, *of Fernton*, G. C. B.	1812
	BAIRD, Dame Ann Preston Campbell, Lady, *of Fernton*	1809
	BAILLIE, Sir William, *of Polkemmet*, Bart.	1818
§	BANNATYNE, Sir W. Macleod, *Whiteford House*	1784
	BERESFORD, Admiral Sir John P., Bart., M. P.	1822
	BRISBANE, Lieutenant-General Sir Thomas, *of Brisbane*	1801
	Baikie, James, *of Tankerness*	1818
	Baillie, Ewen, *younger of Dochfour*	1824
	Baillie, George, *of Jerviswood*,	1800
	Baillie, Lieutenant-Colonel John, *of Leys*, M. P.	1818
80	Baillie, Robert Granberry, *of Coulterallars*	1819
	Bain, Joseph, *younger of Morriston*, Advocate	1826
	Baird, Rev. Dr George H. Principal of the University of Edinburgh, Chaplain of the Society	1793
	Baird, John, *of Shotts Iron-Works*	1815
	Baird, Thomas Elder, *younger of Forneth*, Advocate	1827
	Bald, Robert, Civil Engineer, *Edinburgh*	1828
	Balfour, Charles, W. S.	1825
	Balfour, Francis, *of Fernie*	1824
	Balfour, James, *of Whittinghame*, M. P.	1821
	Balfour, James, *of Pilrig*, W. S.	1824
90	Balfour, John, *of Trenaby*, M. P.	1822
	Balfour, Captain William, *of Elwick*	1819
	Balfour, William, Merchant, *Glasgow*	1820
	Ballantyne, James, *younger of Castlehill*, Advocate	1822
	Balleny, William, Merchant, *Leith*	1828
	Ballingall, George, M. D., Prof. of Mil. Surg. in the University of Edinburgh	1821
	Banks, Robert, *of Craighead, Stirling*	1819
	Bannerman, Charles, *of Crimmonmogate*	1828
	Bannerman, Lieutenant-Colonel John, *late of Madras*	1801
	Bannerman, Patrick, Advocate, *Aberdeen*	1825
100	Barker, John, Surgeon, *Edinburgh*	1821
	Barns, Colonel James Stevenson, *of Kirkhill*	1803
	Bartlemore, Alexander, *of Seabrae*	1825
	Bayley, Isaac, Writer, *Edinburgh*	1828
	Bayne, Dr James, Physician, *Inverness*	1813
	Beatson, David, *of Kirkpottie*	1828

		Admitted
	Beatson, H. Dundas, Captain, Swift Revenue Cutter	1809
	Beatson, Thomas, *of Mawhill*	1829
	Beattie, John, Agent for the British Linen Company, Montrose	829
	Beattie, Thomas, *of Cruive*	1821
110	Beith, John, Banker, *Campbletown*	1826
	Belches, Alexander Hepburn Murray, *of Invermay*	1824
	Belches, Major John H. Murray, *at Invermay*	1825
	Bell, Carlyle, W. S. one of the Principal Clerks of the City of Edinburgh	1824
	Bell, Geo. Jos. Professor of the Law of Scotland, University of Edinburgh	1802
	Bell, George, Surgeon, *Edinburgh*	1804
	Bell, George, Merchant, *Leith*	1826
	Bell, James, *at Woodhouselees, Leith*	1803
	Bell, John, *of Dunaby*	1821
	Bell, Robert, Advocate	1823
120	Bell, William, W. S.	1813
	Berry, William, *of Tayfield*	1800
	Bertram, Gilbert, Merchant, *Leith*	1805
	Bertram, William, Merchant, *Leith*	1805
	Bertram, William, *at Cranshaws*	1826
	Berwick, William, Brewer, *Edinburgh*	1821
	Bethune, Gilbert, *of Balfour*	1806
	Beveridge Thomas, Depute Clerk of Session	1816
	Binning, David Monro, *of Softlaw*, one of the Commissioners of the Customs, London	1799
	Black, John, *of Ardmarnock*	1819
130	Blackburn, John, *of Killearn*	1827
	Blaikie, James, Advocate, *Aberdeen*	1825
	Blair, David Anderson, *of Inchyra*	1819
	Blair, David, *of Cookston*	1809
	Blair, David, *younger of Cookston*	1826
	Blair, Forbes Hunter, *of Dunskey*	1808
	Blair, James, *of Penninghame*, M. P.	1827
	Blair, William, *of Blair*, M. P.	1821
	Blair, William, *of Avonton*	1817
	Bogue, Adam, *of Woodhall*	1822
140	Bonar, Andrew, Banker, *Edinburgh*	1824
	Bonar, John, *of Kimmerghame*, Banker, *Edinburgh*	1818
	Bonar, John, *of Ratho*	1822
	Bonar, William, Banker, *Edinburgh*	1828
	Bontine, R. Cunningham, *of Ardoch*	1829

		Admitted
	Borthwick, George Augustus, M. D. *Edinburgh*	1817
	Borthwick, John, *younger of Crookston,* Advocate	1812
	Borthwick, William Hay, *of Hopesrig*	1821
	Boswall, Thomas, *of Blackadder*	1826
	Boswell, John, *of Kingcausie and Balmuto*	1823
150	Boswell, William, Advocate, Sheriff of Berwickshire	1803
	Bowie, John, *of Camsiscan,* W. S.	1815
	Boyd, Edward, *of Mertonhall*	1813
	Boyd, John, *of Broadmeadows*	1804
	Boyle, Colonel John, *of Shewalton*	1801
	Braidwood, William jun. Manager of the Marine Insurance Company	1807
	Brander, Lieut. Col. James, *of Pitgaveny*	1827
	Bremner, Charles, W. S.	1800
	Briggs, Major John Falconer, *of Strathairly*	1828
	Brodie, Alexander, *Barnie Mains,*	1822
160	Brodie, John, *of Scoughall*	1822
	Brodie, William, *of Brodie,* Lord Lieutenant of Nairnshire	1821
	Brodie, William, *Upper Keith*	1822
	Brown, Alexander, Merchant, and late Provost of Aberdeen	1825
	Brown, George, *of Blairfield*	1828
	Brown, Hugh, *of Broadstone, Ayrshire*	1823
	Brown, Lieut. J. D., *Markle, East Lothian*	1821
	Brown, James, Architect, *Edinburgh*	1815
	Brown, James, Accountant, *Edinburgh*	1816
	Brown, John, *of Coultermains*	1807
170	Brown, John Osborn, W. S. one of the Clerks of the Jury Court	1799
	Brown, Peter, *at Linkwood, Elgin*	1821
	Brown, Robert, Factor on the estate of Hamilton	1802
	Brown, Captain Samuel, R. N. *residing at Muirhouse*	1829
	Brown, Right Hon. Walter, present Lord Provost of the City of Edinburgh	1828
	Brown, William, Merchant, *Glasgow*	1828
	Browne, Isaac Hawkins, Honorary Member	1798
	Bruce, John, *younger of Sumburgh*	1829
	Bruce, Oneziphorus Tyndall, of Falkland,	1829
	Bruce, Robert, *Symbister, Zetland*	1807
180	Bruce, Robert, *of Kennet*	1819
	Bruce, Robert, Advocate, Sheriff of Argyllshire	1828
	Bruce, Thomas, *of Arnot,* one of the Commissioners of Customs for Scotland,	1820
	Bruce, Thomas, *of Langlee,* W. S.	1828

		Admitted
	Bryce, Rev. James, D. D. Minister of the Scots Church, *Calcutta*	1813
	Buchan, George, *of Kelloe*	1826
	Buchan, Robert, *George Street, Edinburgh*	1817
	Buchanan, Alexander, *Arnprior*	1819
	Buchanan, Andrew Carrick, *at Drumpellier*	1827
	Buchanan, Archibald, *of Auchintorlie*	1828
190	Buchanan, David Snodgrass, *of Cunninghamhead*	1803
	Buchanan, the Rev. George Craig, *of Mackeanston*	1814
	Buchanan, James, *of Buenos Ayres, presently residing at Portobello*	1820
	Buchanan, John, *of Ardoch*	1805
	Buchanan, John Cross, *of Auchintoshan*	1824
	Buchanan, John, Wine Merchant, *Glasgow*	1827
	Buchanan, Peter, *of Auchmar*	1818
	Buchanan, Robert Carrick, *of Drumpellier*	1827
	Buchanan, Robert, *Glasgow*	1811
	Buchanan, William, Merchant, *Glasgow*	1828
200	Burd, Melville, W. S.	1826
	Burn, James, W. S.	1825
	Burn, William, Architect, *Edinburgh*	1824
	Burnet, George, *St Andrew Square, Edinburgh*	1815
	Burnett, John, *of Kemnay*	1809
	Burnett, Lieutenant-General William, *of Banchory Lodge*	1813
	Burnett, Thomas, *younger of Leys*	1824
	Burnett, Thomas, Advocate, *Aberdeen*	1825
	Burt, Dr Robert, Physician, *Edinburgh*	1813
	Butter, Archibald, *of Faskally*	1825

C

210	CAITHNESS, The Right Hon. Alexander, Earl of	1814
†	CASSILLIS, The Right Hon. Archibald, Earl of, K. T.	1793
†	CATHCART, General, Right Hon. William, Earl of, K. T.	1807
	CAMPBELL, The Right Hon. Lord John	1798
	CRAIGIE, The Hon. Lord	1791
	CRINGLETIE, The Honourable Lord	1806
	COREHOUSE, The Hon. Lord	1819
	COCHRANE, Admiral the Hon. Sir A. Inglis, Bart. G. C. B.	1816
	CATHCART, Lieutenant-Colonel the Hon. Charles	1809
	CARMICHAEL, Sir Thomas Gibson, *of Castlecraig*, Bart.	1806
220	CAMPBELL, Sir W. P. Hume, *of Marchmont*, Bart.	1817

		Admitted
	CUNNINGHAME, Colonel Sir James Montgomery, *of Fearness*, Bart.	1807
	CLERK, Sir George, *of Penicuik*, Bart. M. P.	1812
	COLQUHOUN, Sir James, *of Luss*, Bart.	1801
	CAMPBELL, Sir Archibald, *of Succoth*, Bart.	1813
	CAMPBELL, Sir John, *of Airds*, Bart.	1787
	CAMERON, Sir Duncan, *of Fasfern*, Bart.	1800
	CAMPBELL, Colonel Sir Colin, K. C. B.	1816
	COCHRANE, Captain Sir Thomas, Royal Navy, K. C. B.	1817
	CAMPBELL, Sir James, G. C. B.	1797
230	Caird, James, *of Drumfad*	1814
	Calderwood, Thomas Durham, *of Polton*	1822
	Callender, William Burn, *of Prestonhall*	1818
	Cameron, Alexander, *Surinam*	1819
	Cameron, Allan, *North Uist*	1803
	Cameron, Colonel Donald, *of Locheil*	1793
	Cameron, Donald Charles, *of Foxhall*	1825
	Cameron, Gordon, *of Letterfindlay*	1806
	Cameron, John, *Corrychoiley and Gleneaves*	1826
	Cameron, Lieutenant-Colonel Robert, *late of Madras*	1804
240	Cameron, Robert, Accountant, *Edinburgh*	1825
§	Campbell, General Alexander, *of Monzie*,	1784
	Campbell, Lieutenant-Colonel Alexander, *of Ballochyle*	1807
	Campbell, Lieut.-Col. Alexander, *of Possill*	1810
	Campbell, Captain Alexander, *of Brackley*	1806
	Campbell, Alexander, *late of Tobago*	1799
	Campbell, Alexander, *Greenock*	1804
	Campbell, Alexander, *of Elderline*	1807
	Campbell, Alexander, *of Strond*	1829
	Campbell, Alexander Brodie, *of Fomighty*, Hon. East India Company's Service	1816
250	Campbell, Archibald, *of Jura*	1789
	Campbell, Archibald, *of Blythswood*, M. P.	1800
	Campbell, Archibald, *of Drumsainey*	1808
	Campbell, Archibald Graham, *of Shirvan*	1807
	Campbell, Archibald, *of Catrinebank*	1810
	Campbell, Archibald, *of Askomel*, Captain Royal Artillery	1810
	Campbell, Captain Archibald, Chamberlain to His Grace the Duke of Argyll	1811
	Campbell, Archibald James, *of Kilpatrick*	1824
	Campbell, Archibald, *of Glendaruel*	1826
	Campbell, Arthur, W. S.	1816
260	Campbell, Charles, *of Combie*	1808

		Admitted
	Campbell, Major Colin, *Balliveolan*	1789
	Campbell, Colin, *Albyn Place, Edinburgh*	1810
	Campbell, Colin, *at Posill*	1829
	Campbell, David, Factor on the estate of Menzies	1829
	Campbell, Major Donald, *of Knock*	1806
	Campbell, Donald, *of Polmont Bank*, 12th Lancers	1823
	Campbell, Dougald, *of Ballinaby*	1793
§	Campbell, General Duncan, *of Lochnell,*	1784
	Campbell, Dugald, *of Kildaloig*	1813
270	Campbell, Dugald, *of Illandrie*	1805
	Campbell, Major Dugald, Royal Artillery	1818
	Campbell, Duncan, *of Ross*	1823
	Campbell, Duncan, *late at Ardgower*	1802
	Campbell, Henry Fletcher, *of Boquhan*	1823
	Campbell, James Muir, *Ayr*	1825
	Campbell, James, *younger of Jura*	1827
	Campbell, Colonel James, *late of Madras*	1801
	Campbell, James, *younger of Craigie,* Advocate	1824
	Campbell, John, *of Craignure*	1803
280	Campbell, John, *of Stonefield*	1808
	Campbell, John, *of Glen Saddel*	1817
	Campbell, John, *of Blairhall*	1819
	Campbell, John, *of Southhall*	1821
	Campbell, John, *younger of Succoth,* M. P.	1824
	Campbell, John, *younger of Otter*	1827
	Campbell, John, *of Strachur*	1829
	Campbell, Lieutenant-Colonel John, H. E. I. C. Service	1817
	Campbell, Captain John Kilmartin, late 46th Foot	1803
	Campbell, John Archibald, W. S.	1813
290	Campbell, John, *of Carbrook,* W. S.	1793
	Campbell, John, *of Lincoln's Inn*	1800
	Campbell, John, W. S. *now of London*	1787
§	Campbell, John, Clerk to the Signet,	1784
	Campbell, John, *late of Lochend,*	1803
	Campbell, John, *younger of Airds*	1829
	Campbell, Lorne, Factor to Duke of Argyle *at Roseneath*	1824
	Campbell, Mungo Nutter, *of St Catherines*	1824
	Campbell, Captain Neil, *of Dunstaffnage*	1795
	Campbell, Captain Patrick, *of Inveraw*	1799
300	Campbell, Captain Patrick, Royal Navy	1819
	Campbell, Captain Peter, H. E. I. C. Naval Service	1819
	Campbell, Richard, *of Craigie*	1829
	Campbell, Major-General Robert, *of Kintarbert*	1789

		Admitted
	Campbell, Robert Nutter, *of Kailzie*	1798
	Campbell, Robert, *of Sonochan*	1802
	Campbell, Robert, *younger of Auchmannoch*	1816
	Campbell, Rose, *late of Spain*	1809
	Campbell, Walter Frederick, *of Shawfield and Ilay*, M.P.	1817
	Campbell, Walter, *of Carradale*	1804
310	Campbell, Walter, *of Sunderland*	1818
	Campbell, William, *of Netherplace*	1810
	Campbell, William, W. S.	1805
	Canning, James, *residing at Shiels*	1813
	Carmichael, Maurice, *of Eastend*	1827
	Carmichael, Michael, *younger of Eastend*	1825
	Carnegie, David, *of Craigo*	1825
	Carnegy, William Fullarton, *of Boysack*	1824
	Carnegy, James, *of Balnamoon*	1813
	Carruthers, Alexander, *of Warmanbie*	1826
320	Carruthers, Lieutenant-Colonel J., *of Denby*	1824
	Carruthers, William Thomas, *of Dormont*	1823
	Cassels, David, *younger of Arnprior*	1824
	Cathcart, Elias, of Alloway, Advocate	1819
	Cathcart, James, Merchant, *Leith*	1805
	Cathcart, John, *of Genoch*	1803
	Chalmers, Alexander, *of Cluny and Knockorth*	1826
	Chalmers, Charles, Advocate, *Aberdeen*	1824
	Chalmers, Lieut. Col. W. *of Glenericht*	1822
	Chancellor, Alexander, *of Shieldhill*	1818
330	Cheape, Major John, *Edinburgh*	1814
	Cheine, Patrick, *Great King Street, Edinburgh*	1820
	Cheyne, Capt. Alexander, Royal Engineers, *Edinburgh*	1825
	Cheyne, James Auchinleck, *of Oxendean*, W. S.	1825
	Christie, Andrew, of Ferrybank	1813
	Christie, Robert, Accountant, *Edinburgh*	1824
	Clark, Robert, *of Comrie*	1810
	Clason, Andrew, W. S.	1820
	Cleghorn, George, *of Weens*	1821
	Cleland, James, LL. D. Superintendent of Public Works, *Glasgow*	1827
340	Clunes, Major William, *of Cracaig*	1820
	Cochrane, William, *of Ladyland*	1815
	Cockburn, Patrick, Accountant, *Edinburgh*	1824
	Colquhoun, James, younger *of Luss*	1829
	Colquhoun, John Campbell, *of Clathick and Killermont*	1824

		Admitted
	Colquhoun, John, Sheriff of Dunbartonshire	1807
	Connel, James, *Leith*	1804
	Connell, James, *of Conheath*	1828
	Cooper, Alexander, *of Smithston*	1810
	Cooper, Samuel, *of Ballindalloch*	1818
350	Corrie, Thomas, *of Culloch*, Manager British Linen Co.	1826
	Couper, Peter, W. S.	1811
	Coventry, Dr Andrew, Professor of Agriculture, University of Edinburgh	1793
	Cowan, Alexander, Merchant, *Edinburgh*	1810
	Cowan, Duncan, Merchant, *Edinburgh*	1810
	Craig, Alexander, Merchant, *Edinburgh*	1818
	Craig, Alexander, *Kirkton*	1821
	Craig, John, Merchant, *Edinburgh*	1818
	Craig, William Gibson, *younger of Riccarton*	1824
	Craigie, Lawrence, *of Glendoick*	1824
360	Craik, Douglas H., *of Arbigland*	1822
	Crawford, Charles, *East Fortune*	1822
	§ Crawford, Captain James, of the Cumbraes Cutter	1784
	Crawford, John Innes, *of Bellfield*	1815
	Crawford, John, Duncan Street, *Newington*	1826
	Crawford, John, *of Auchinames*	1818
	Crawford, William Macknight, *of Cartsburn*	1809
	Crawford, William Howison, *of Crawfordland*	1809
	Crawfurd, John, late British Resident at Java	1819
	Crichton, Thomas, *of Auchinskeoch*, Advocate, Chamberlain to the Duke of Buccleuch	1795
370	Crombie, Alexander, *of Phesdo*	1827
	Crow, James, *at Kincraig*	1826
	Cruickshanks, James, *younger of Langleypark*	1829
	Cumming, Charles Lennox, *of Roseile and Kinnaird*	1817
	Cunningham, Colonel John, *of Newton*	1829
	Cunningham, William, *of Lainshaw*	1810
	Cunninghame, William, *of Craigends*	1828
	Curle, William, *of Eastfield*	1821
	Cuthbertson, Archibald, *Peanston*	1822
	Cuthbertson, Donald, Accountant, *Glasgow*	1827
380	Cuthbertson, James, *Seton Mains*	1824

D

		Admitted
†	DALHOUSIE, Lieutenant-General the Right Hon. George, Earl of, G. C. B	1804
§	DUFFUS, The Right Hon. Benjamin, Lord	1784
	DOUGLAS, The Right Hon. Archibald, Lord	1825
	DUNDAS, The Right Hon. Lawrence, Lord	1800
	DUNDAS, The Right Hon. William, Lord Clerk-Register	1801
	DUFF, Lieutenant-General the Hon. Alexander, M. P.	1814
	DOUGLAS, Honourable Charles, *of Douglas*	1806
	DALYELL, Sir James, *of Binns*, Bart.	1798
	DENHAM, General Sir James Stewart, *of Coltness*, Bart.	1800
390	DALRYMPLE, Lieutenant-General Sir John Hamilton *of Cranston and Cousland*, Bart.	1817
	DUNBAR, Sir Archibald, *of Northfield*, Bart.	1794
	DICK, Sir Robert Keith, *of Prestonfield*, Bart.	1816
	DOUGLAS, Sir J. Scott, *of Springwood Park*, Bart.	1823
	DUNBAR, Sir James, of Boath, Bart. R. N.	1802
	DUNDAS, Sir Robert, *of Dunira*, Bart.	1793
	DRUMMOND, Sir F. Walker, *of Hawthornden*, Bart.	1823
	DURHAM, Vice-Adm. Sir P. Henderson *of Fordel*, G C. B.	1823
	DALLAS, Major-General Sir Thomas Knight	1805
	D'ESTE, Colonel Augustus Frederick	1822
400	Dallas, James, Merchant, *Edinburgh*	1819
	Dalrymple, Major-General John, *of North Berwick*	1823
	Dalyell, John, *of Lingo*	1823
	Dalyell, John Graham, Advocate	1807
	Darling, Thomas, S. S. C.	1821
	Daubeny, Robert Henry, *of Bristol*	1826
	Davidson, Duncan, *of Tulloch*, M. P.	1824
	Davidson, Duncan, *of Tillychetly*	1824
	Davidson, Henry, *Haddington*	1809
	Davidson, James Gillespie, W. S.	1819
410	Davidson, James, *Milnholm*, Factor to his Grace the Duke of Buccleuch,	1828
	Davidson, John James, W. S.	1824
	Davidson, Laurence, W. S.	1829
	Davidson, Robert, Advocate	1819
	Davidson, William, *of Hatton*	1809
	Dempster, George, *of Skibo*	1823
	Dennistoun, James, *of Dennistoun*	1822
	Dennistoun, James, *younger of Dennistoun*	1829

		Admitted
	Dennistoun, James, *of Golfhill*, Banker, *Glasgow*	1827
	Dick, David, *of Glensheil*	1814
420	Dick, John, Advocate	1827
	Dick, Col. R. H. *of Tullimet*, 42d, or Royal Highlanders	1828
	Dick, William, *younger of Pitkarro*	1828
	Dickson, Andrew, *of Alton*	1823
	Dickson, Arch., *of Huntlaw*	1823
	Dickson, John, *of Kilbucho and Hartree*	1802
	Dickson, Walter, Merchant, *Edinburgh*	1807
	Dillon, John, *Glasgow*	1800
	Dirom, General Alexander, *of Mount Annan*	1796
	Dixon, John, *of Daldowie*, Merchant, *Glasgow*	1827
430	Dixon, William, *of Govan*, Merchant, *Glasgow*	1827
	Don, General Alex. Lieutenant-Governor of Gibraltar	1804
	Donaldson, James, *of Broughtonhall*	1796
	Donaldson, John, *of Aucharn*, W. S.	1812
	Donaldson, Captain John Boswall of Wardie, R. N.	1814
	Douglas, Archibald, *of Adderstone*	1822
	Douglas, Archibald, Advocate	1823
	Douglas, George Advocate, Sheriff of Kincardineshire	1800
	Douglas, Lieut.-Col. William, late of the 85th Regiment	1803
	Douglas, John, *of Lockerby*	1825
440	Douglas, William Robert Keith, M. P.	1819
	Downie, Robert, *of Appin*, M. P.	1814
	Dron, William, *of Blackruthven*	1829
	Drummond, Adam, *of Megginch*, Capt. R. N.	1822
	Drummond, George Harley, *late of Drumtochty*	1810
	Drummond, Henry Home, *of Blair Drummond*, M. P.	1809
	Drummond, Thomas, *younger of Newton*	1828
	Dudgeon, Alexander, *of St Helen's*	1826
	Dudgeon, Patrick, *of Eastcraigs*, W. S.	1827
	Dudgeon, Robert, Merchant, *Leith*	1828
450	Dudgeon, William, Merchant, *Leith*	1826
	Duff, Adam, Advocate, Sheriff of Edinburgh	1813
	Duff, Garden, *of Hatton*	1814
	Duff, James Grant, *of Eden*	1828
	Duff, Robert William, *of Fetteresso*	1804
	Duff, Robert, *younger of Fetteresso*	1823
	Duff, Richard Wharton, *of Orton*, Comptroller of Excise	1805
	Dunbar, Major P., 3d Regt. of Bengal Cavalry	1823
	Duncan, Alexander, *of Glendivine*	1824
	Duncan, Andrew, M. D. *Edinburgh*	1808
460	Duncan, James, *at Cargill*	1826

			Admitted
		Duncan, James, Merchant, *Leith*	1826
		Dundas, David, *younger of Beechwood*	1828
		Dundas, Gabriel Hamilton, *of Duddingston*	1823
		Dundas, James, *of Dundas*, Vice-Lieut. of West Lothian	1827
		Dundas, Robert, *of Arniston*	1820
		Dundas, Robert Adam, M. P.	1825
		Dunlop, Alexander, Advocate	1828
		Dunlop, Arch., Distiller, *Haddington*	1823
		Dunlop, Lieutenant-General James, *of Dunlop*	1818
470		Dunlop, James, *of Annanhill*	1824
		Dunlop, James, W. S.	1823
		Dunlop, John Colin, Advocate, Sheriff of Renfrewshire	1824
		Dunlop, William, Merchant, *Edinburgh*	1820
		Dunn, William, *of Kilbowie*, Merchant, *Glasgow*	1827
		Dunsmure, James, Secretary Herring Fishery Board	1817
		Durham, Lieutenant-General James *of Largo*	1823

E

	†	ELGIN & KINCARDINE, The Right Hon. Thomas, Earl of, K. C.	1818
		ELIBANK, The Right Hon. Alexander, Lord	1809
	†	ELCHO, The Right Hon. Francis, Lord	1819
480	§	ELDIN, The Honourable Lord	1784
		ELLIOT, Sir William *of Stobbs*, Bart.	1823
		EDMONSTONE, Sir Archibald, *of Duntreath*, Bart.	1821
		ELPHINSTONE, Sir Robert Dalrymple Horn, *of Logie-Elphinstone*, Bart.	1813
		Eddington, James, *of Gargunnock*	1814
		Eddington, Thomas, Merchant, *Glasgow*	1813
		Edmonstone, Archibald, *of Spittal*	1819
		Edmonstone, James, *of Newton*	1798
		Elder, John, Merchant, *Slate*	1815
		Elliot, George Scott, *of Larriston*	1813
490		Elliot, James, *of Wolflie*	1826
		Elliot, Theodore F., *at Braco Castle*, Captain Engineers H. E. I. C. S.	1824
		Ellis, William, S. S. C.	1821
		Elphinstone, Lieut. Col. John	1827
		Erskine, James, *of Cambus*	1808
		Erskine, John James, one of the Members of Council Prince of Wales Island	1823
		Erskine, Col. William Howe Knight, *of Pitodrie*	1820
		Ewing, James, LL. D. *of Dunoon Castle*, Merchant, *Glasgow*	1827

F

		Admitted
†	Fife, The Right Hon. James, Earl of, K. T., G. C. B.	1805
	Fingal, The Right Hon. the Earl of	1810
500	Fleming, Vice-Admiral the Hon. Charles Elphinstone, *of Biggar and Cumbernauld*	1824
	Flahault, Charles, Count Mercer De	1821
	Ferguson, Sir James, *of Kilkerran*, Bart.	1805
	Fettes, Sir William, *of Comely Bank*, Bart.	1801
	Forbes, Sir Charles, of *Edinglassie*, Bart. M. P.	1814
	Foulis, Sir James, *of Woodhall*, Bart.	1816
	Ferguson, Sir Adam, Knight, Keeper of the Regalia	1799
	Fairbairn, T., *late of St Vincent's*	1802
	Fairlie, James, *of Holmes*	1827
	Falconer, Alexander, *Nairnside*	1809
510	Falconer, Æneas, *Blackhills*,	1810
	Falconer, Cosmo, *of Hartwoodhill*	1805
	Falconar, David, *of Carlowrie*	1807
	Falconer, Peter, *at Craigelachie*	1821
	Farquhar, Lieutenant-Colonel William, Madras Engineers, late British Resident at Singapore	1827
	Farquhar, Captain, R. N. C. B.	1826
	Farquharson, Andrew, *of Breda*	1800
	Farquharson, Archibald, *of Finzean*	1815
	Farquharson, Colonel James Alexander, 25th Regiment	1189
	Farquharson, James, of Inverey	1789
520	Farquharson, John, *of Haughton*	1808
	Fergusson, Adam, *of Woodhill*	1807
	Fergusson, Major-General Archibald, *of Dunfallandie*	1824
	Fergusson, Charles, *younger of Kilkerran*, Advocate	1826
	Ferguson, George, *of Pitfour*	1828
	Fergusson, James, *of Crosshill*, Principal Clerk of Session	1800
	Ferguson, James, *of Kinmundy*	1826
	Fergusson, James, W. S.	1826
	Ferguson, John, *of Stronvar*	1805
530	Ferguson, John *of Knockindale*	1824
	Fergusson, John, Wine-Merchant, *Leith*	1826
	Ferguson, Robert, *of Raith*	1825
	Fergusson, Robert Cutlar, *of Craigdarroch*, M. P.	1826
	Ferguson, Thomas, W. S.	1821
	Ferrie, Robert, *of Blairtummock*,	1827
	Ferrier, John, W. S.	1796

		Admitted
	Ferrier, Louis, H. *of Belleside*	1825
	Finlay, Kirkman, *of Castle Toward*	1814
	Finlay, James, *younger of Castle Toward*	1826
	Finlay, William Warwick, *younger of Trees*	1826
540	Fisher, Daniel, S. S. C.	1819
	Fisher, James, M. D., late Staff Surgeon to the Army in Canada	1821
	Fleming, Robert, *Minto Street, Edinburgh*	1829
	Flemying, Robert Stewart, *of Killiechassie*	1826
	Fletcher, Angus, *of Dunans*, Advocate	1826
	Fletcher, John, *of Bernice*	1826
	Fletcher, Miles A. Advocate	1819
	Flyter, Robert, Sheriff-Substitute Fort William,	1821
	Forbes, Alex.ander, *of Inverernan*	1822
	Forbes, Alexander Irvine, *of Chivas*	1805
550	Forbes, Charles, *of Asloun*, second son of Sir Charles Forbes, Bart.	1828
	Forbes, Rev. Dr George, *of Blelack*	1803
	Forbes, George, Banker, *Edinburgh*	1817
	Forbes, James, *Kingerloch*	1807
	Forbes, John, *younger of New and Edinglassie*, M. P.	1828
	Forbes, Michie, *of Crimond*	1806
	Forbes, Major-General Nathaniel, *of Auchernach*	1828
	Fordyce, Thomas G , *of Ayton*	1828
	Forman, John, W. S.	1809
	Forrest, James, G. *of Comiston*	1805
560	Forsyth, Alex. S. S. C.	1798
	Forsyth, John, *Forres*	1826
	Fotheringham, Thomas Ogilvie, *of Powrie*	1824
	Fouler, James, of *Raddrey*	1806
	Fraser, Vice-Admiral Alexander	1802
	Fraser, Alexander, *of Inchcoulter*	1805
	Fraser, Alexander, Merchant, *Aberdeen*	1817
	Fraser, Captain Alexander, Royal Engineers	1818
	Fraser, Archibald Thomas Frederick, *of Abertarff*	1820
	Fraser, Colonel Charles, *of Inverallochy and Castle Fraser*	1816
570	Fraser, George, Merchant, *Manchester*	1825
	Fraser, Hugh, *of Eskadale*	1819
	Fraser, James Bristow, *of Gorthleck*	1807
	Fraser, James, *Redcastle House*	1807
	Fraser, John, Cashier, *Cullen House*	1812
	Fraser, John, Advocate	1802
	Fraser, Robert, *of Torbreck*	1802

		Admitted
	Fraser, Simon, *of Foyers*	1800
	Fraser, Simon, *of Ford*, Advocate	1828
	Fraser, Thomas, Captain, R. N.	1817
580	Fraser, Thomas Alexander, *of Lovat*	1820
	Fraser, Captain William, *residing at Brackla*	1809
	Fraser, William, *of Glenmead*, W. S.	1816
	Fullarton, Colonel, S. M. *of Fullarton*,	1825
	Fullarton, John, *of Demerara, Brisbane House*	1825
	Fullerton, Capt. James, 30th Regt.	1824
	Fullerton, John, *of Kilmichael*	1807
	Fullerton, William, Advocate	1801
	Fyfe, Andrew, M. D. *Edinburgh*	1823
	Fyffe, James, *of Smithfield*	1806

G

590 †	Gordon, His Grace George, Duke of, G. C. B.	1791
	Graham, The Most Noble James, Marquis of	1821
	Galloway, The Right Hon. George, Earl of, K. T.	1807
† §	Glasgow, The Right Honourable George, Earl of	1784
†	Gower, The Right Honourable George, Earl	1813
†	Glenlyon, The Right Honourable James, Lord	1804
	Glenorchy, The Right Honourable John, Viscount	1819
	Gower, The Right Hon. Lord Francis Leveson, M. P., Secretary of State for Ireland	1822
†	Gray, The Right Honourable Francis, Lord	1793
	Gordon, Capt. the Hon. William, R. N., M. P. for Aberdeenshire	1824
600	Grant, The Right Honourable Charles, M. P. *for Inverness-shire*	1816
	Grant, Colonel The Honourable Francis William, *of Grant*, M. P.	1803
	Gray, The Hon. John, eldest son of Lord Gray	1821
	Gillies, The Honourable Lord	1809
	Gordon, Sir James, *of Letterfourie*, Bart.	1800
	Gordon, Sir John, *of Earlston*, Bart.	1827
	Gordon, Sir William Cumming, *of Altyre and Gordonston*, Bart.	1808
	Gibson, Sir Alexander C. Maitland, *of Cliftonhall*, Bart.	1818
	Gordon, Sir Alexander, *of Culvenan*, Knight	1805
	Grant, Sir John Peter, *of Rothiemurchus*, Knight, one of the Judges of the Supreme Court, *Bombay*	1792

		Admitted
610	Galbraith, William, *younger of Blackhouse*, Town-Clerk, Stirling	1822
	Galbreath, David Stewart, *of Machrihanish*	1812
	Galloway, William, Merchant, *Edinburgh*	1814
	Garden, Alexander, *of Croy*, Merchant, *Glasgow*	1827
	Gardiner, George, Writer, *Perth*	1828
	Garioch, John, *of Heathcote*	1826
	Garthshore, John Murray, *of Garthshore*	1825
	Geddes, Adam G. *Airfield, Dalkeith*	1819
	Gibson, John, W. S.	1825
	Gibson, John *jun.* W. S.	1828
620	Gibson, Rev. Thos. *of Glencrosh*, Minister of Lochmaben	1823
	Gilchrist, Dugald, *of Ospisdale*	1817
	Gillanders, John, *of Highfield*	1800
	Gillespie, Alexander, Surgeon, *Edinburgh*	1806
	Gillespie, George, *of Biggar Park*	1829
	Gillespie, James, *of Parkhall*	1829
	Gillespie, Robert, Merchant, *London*	1829
	Gillespie, Thomas, *of Ardochy*	1821
	Gillespie, William, *Gateside*	1829
	Gillon, William Doune, *of Wallhouse*	1823
630	Gilmour, Walter James Little, *of Craigmillar*	1828
	Gilzean, Thomas, *of Bunachton*	1813
	Glasford, James, *of Dugaldstone*, Advocate	1806
	Goalen, Alexander, *of Leith*	1805
	Goldie, Alexander, W. S.	1822
	Goldie, Archibald W., W. S.	1828
	Gordon, Lieut. Col. Alex., late Sutherland Highlanders	1801
	Gordon, Captain Alexander, R. N.	1820
	Gordon, Alexander, *of Auchlunies*	1808
	Gordon, Alexander, *Great King Street, Edinburgh*	1817
640	Gordon, David, *of Abergeldie*	1822
	Gordon, George, Factor for His Grace the Duke of Gordon, *at Huntly*	1829
	Gordon, Lieutenant-Colonel George, *of Invertromie*	1825
	Gordon, James, *of Culvenan*, one of the Commissaries of Edinburgh	1798
	Gordon, James Farquhar, *of Locharwoods*, W. S.	1804
	Gordon, James, *of Revack*	1813
	Gordon, Colonel John, *of Cluny*, M. P.	1807
	Gordon, John David, *younger of Wardhouse*	1828
	Gordon, John, W. S.	1802
	Gordon, John, *of Swinzie*	1807

		Admitted
650	Gordon, John, *of Cairnbulg*, Advocate	1811
	Gordon, John, *of Aikenhead*	1814
	Gordon, John, of *Corstoun*	1829
	Gordon, John, late Major of the 2d or Queen's Regt.	1822
	Gordon, Joseph, W. S.	1804
	Gordon, Lewis, one of the Depute-Secretaries of the Society	1799
	Gordon, Robert, *of Jamaica*	1802
	Gordon, Thomas, *of Buthlaw*	1818
	Gordon, Lieutenant-Colonel Thomas, *of Park*	1825
	Gordon, General, The Honourable William, *of Fyvie*	1803
660	Gordon, Lieut. Col. W. A., late 50th Regiment	1818
	Gordon, Capt. Wm. H. E. I. C. Service, *residing at Newton*	1828
	Gordon, Captain William, *Minmore*	1802
	Govan, John, W. S.	1809
	Græme, Robert, *of Garvock*	1824
	Graham, Frederick, Factor to the Duke of Athole	1821
	Graham, George, *late of Cassafuar*	1817
	Graham, George, *of Shaw*	1826
	Graham, Humphry, *Edinburgh*	1803
	Graham, Humphrey, W. S.	1819
670	Graham, James, *of Leitchtown*	1827
	Graham, James Gillespie, *of Orchill*, Architect, Edinburgh	1806
	Graham, John, *younger of Ballagan*	1823
	Graham, John, *at Newbigging*	1829
	Graham, Robert, *of Redgorton*, Advocate	1817
	Graham, Robert, M. D., Professor of Botany in the University of Edinburgh	1821
	Graham, Robert, Merchant, *Leith*	1826
	Graham, William, *of Mossknow*	1801
	Graham, William, Writer, *Glasgow*	1828
	Graham, William C. Cuningham, *of Gartmore*	1796
680	Grant, Alexander, one of the Representatives in the Honourable House of Assembly, Jamaica	1810
	Grant, Colonel Alexander, *of Findrassie*	1826
	Grant, Captain Charles, *Durn House*	1816
	Grant, David Macdowal, *of Arndilly*	1792
	Grant, Duncan, *younger of Bught*, W. S.	1825
	Grant, George Macpherson, *of Ballindalloch and Invereshie*	1806
	§ Grant, James, *of Corymony*, Advocate	1784
	Grant, James, W. S.	1793
	Grant, James M., *of Glenmoriston and Moy*	1810
	Grant, James, *of Bught*	1813

		Admitted
690	Grant, James, Principal Tacksman of Ruthven	1827
	Grant, Rev. James, First Minister of South Leith	1828
	Grant, Captain John, *of Firhall, Nairnshire*	1820
	Grant, John Peter, W. S.	1823
	Grant, John, *of Kilgraston*	1819
	Grant, John Macpherson, *younger of Ballindalloch and Invereshie*	1827
	Grant, Major John, *of Auchterblair*	1813
	Grant, Major-Gen. Lewis, Governor of Trinidad	1826
	Grant, Colonel Ludovick, *late of Bengal*	1801
	Grant, Patrick, *of Lakefield*	1818
700	Grant, Robert, *of Kincorth*	1826
	Grant, William, *of Seabank*	1807
	Grant, W. P., *younger of Rothiemurchus*	1821
	Grassick, John, *Mains of Glenbucket*	1829
	Gray, Roderick, Factor for the Merchant Maiden Hospital, *Peterhead*	1829
	Greenhill, Alexander, *of Fearn*, Advocate	1825
	Greenlaw, George, *Hilton*	1796
	Greenshields, John, *of Kerse*	1829
	Gregorson, John, *of Ardtornish*	1805
	Greig, James, *of Eccles*, W. S.	1809
710	Greig, James, *at Tullich*	1821
	Grierson, William, *of Garroch*, W. S.	1828
	Gunn, George, Factor on the estate of Sutherland	1821
	Guthrie, Major, *Cottage*, Dundee	1826

H

*	HAMILTON & BRANDON, His Grace Alexander, Duke of, President of the Society	1804
	HASTINGS, The Right Hon. Flora, Marchioness of	1805
†	HADDINGTON, The Right Hon. Thomas, Earl of	1804
	HOPETOUN, The Right Hon. John, Earl of	1826
	HAY, The Right Hon. Lord John, M. P.	1824
	HERRIES, The Right Hon. J. C. Master of the Mint	1829
720	HOPE, The Right Honourable Charles, Lord President of the Court of Session	1793
	HALLYBURTON, The Hon. Douglas Gordon, *of Pitcur*	1803
	HOPE, Sir John, *of Craighall*, Bart.	1808
	HAY, Sir John, *of Smithfield and Hayston*, Bart. Banker, Edinburgh	1793
	HALL, Sir James, *of Dunglas*, Bart.	1796

		Admitted
	HAMILTON, Sir Hew Dalrymple, *of Bargeny and North Berwick*, Bart. M. P.	1797
	HAY, Sir James Dalrymple, *of Park Place*, Bart.	1816
	HONYMAN, Sir Richard B. Johnston, *of Armadale*, Bart.	1817
	HEPBURN, Sir John Buchan, *of Letham*, Bart.	1813
	HOPE, Lieut. Gen. Sir John, Col. of the 72d Highlanders, K. C. B.	1824
730	HALLIDAY, Sir Andrew, M. D.	1806
	Hagart, Thomas, *of Bantaskine*	1826
	Hagart, William, late Merchant, *Leith*	1804
	Haig, William, *younger of Dollarfield*	1825
	Hall, John, *of Dunglass*	1829
	Hamilton, Alexander, *of Grange*, Advocate	1787
	Hamilton, Archibald, *younger of Dalzell*	1822
	Hamilton, The Reverend G. T., Minister of Ashkirk	1810
	Hamilton, Hugh, *Pinmore*	1802
	Hamilton, Dr James, *of Corwar*, Professor of Midwifery University of Edinburgh	1817
740	Hamilton, James, *of Kames*, W. S.	1807
	Hamilton, James, *of Barns*	1828
	Hamilton, John, *of Sundrum*,	1804
	Hamilton, John Ferrier, *of Westport*	1827
	Hamilton, John, *of Fairholm*	1827
	Hamilton, Lieut. Col. R. Campbell, *of Milburn and Dalserf*	1804
	Hamilton, Robert William, Merchant, *Leith*	1814
	Hamilton, Robert, Advocate, Principal Clerk of Session	1802
	Hamilton, Thomas, Architect, *Edinburgh*	1826
	Hamilton, William, Merchant, *Glasgow*	1823
750	Hamilton, William, *of Craighlaw*	1829
	Hare, James, *Calderhall*	1806
	Harley, William, *Glasgow*	1812
	Hart, Major Thomas *of Castlemilk*	1805
	Harvey, Alexander, *of Broadland*	1811
	Harvey, James, *of Castlesemple*	1823
	Harvey, John, W. S.	1811
	Harvey, John, *of Ickwell, Bury, and Tiningly Park, Yorkshire*	1809
	Hathorn, Hugh, *of Castlewig*	1825
	Hathorn, Vans, *of Garthland*, W. S.	1802
760	Hawes, Benjamin, *of Old Barge Stairs, Blackfriars, London*	1808
	Hawkins, John Whitshed, *of Dunnichen*, Advocate	1819
	Hay, Adam, Banker, *Edinburgh*, M. P.	1825

		Admitted
	Hay, General Alexander, *of Rannes*	1812
	Hay, Major A. Leith, *younger of Rannes*	1819
	Hay, Charles, *of Ballindoch*	1825
	Hay, James, *of Belton*	1820
	Hay, James, Merchant, *Leith*	1828
	Hay, John, *younger of Smithfield and Hayston*, Advocate	1811
	Hay, Robert, *of Spott*	1807
770	Hay, William, *of Laxfrith*	1828
	Hay, William, *of Drummelzier*	1819
	Hector, Alexander, Writer, *Edinburgh*	1824
	Henderson, Alexander, Merchant, *Edinburgh*	1813
	Henderson, Captain David, *younger of Stemster*	1829
	Henderson, Duncan, M. D. 78th Highlanders	1825
	Henderson, John Irving, Advocate	1823
	Henderson, Capt. William *of Gloup*, late 27th Regt.	1820
	Henderson, William, Merchant, *Edinburgh*	1811
	Henderson, William, late Secretary British Linen Company	1823
780	Henry, John, *of Corse*	1815
	Hepburn, John, *of Colquhalzie*	1810
	Hepburne, Robert, *of Clerkington*	1806
	Herries, William Young, *of Spotts*	1823
	Heriot, John, *Ladykirk*	1828
	Herriot, James, *of Ramornie*, W. S.	1800
	Hill, George Gosset, Merchant, *London*	1823
	Hill, Henry David, W. S.	1825
	Hill, Norman, *of Brownhills*, Advocate	1807
	Hill, Robert, *of Firth*, W. S.	1800
790	Hood, John, *of Stoneridge*	1827
	Home, Francis, *younger of Cowdenknows*	1829
	Home, Colonel James, *of Broomhouse*	1829
	Home, Dr James, *of Cowdenknows*, Professor of Physic in the University of Edinburgh	1799
	Home, William Forman, *of Billie and Paxton*	1823
	Hope, James, W. S.	1804
	Hope, John, His Majesty's Solicitor General for Scotland	1823
	Hope, Dr Thomas Charles, Professor of Chemistry in the University of Edinburgh	1804
	Horne, Archibald, Accountant, *Edinburgh*	1828
	Horne, Donald, W. S.	1817
800 §	Horne, James, *of Langwell*	1784
	Horne, William, *of Stircock*, Advocate, Sheriff of Haddingtonshire	1813
	Horrocks, John, *of Tillheuen Castle*	1818

		Admitted
	Horsburgh, John, Factor to the Marquis of Stafford, for the estate of Reay	1829
	Horsburgh, Major William Henry, *Edinburgh*	1824
	Hoseason, Robert, *of Mossbank, Shetland*	1826
	Hosier, James, *younger of Newlands,* Advocate	1822
	Houston, Ludovick, *of Johnston Castle*	1823
	Houston, Thomas, *of Creech*	1821
	Howard, Lieutenant-Colonel, *late North British Staff*	1809
810	Howden, James, Jeweller, *Edinburgh*	1827
	Hunt, James, *of Pittencrieff and Logie*	1816
	Hunter, Alexander, W. S.	1824
	Hunter, Andrew, *of Hollybush*	1819
	Hunter, Charles, *residing at Templehall*	1826
	Hunter, Charles, *younger of Seaside*	1823
	Hunter, David, *of Blackness*	1826
	Hunter, Duncan, *London*	1802
	Hunter, George, *of Callander*	1820
	Hunter, James, *of Thurston*	1812
820	Hunter, James, *of Templehall*	1823
	Hunter, Capt. James, of His Majesty's 70th Regt.	1823
	Hunter, James, *of Seaside*	1826
	Hunter, James, *of Hafton*	1825
	Hunter, William, *of Ormistoun*	1812
	Hutchison, Hugh, *of Southfield*	1812
	Hutchison, Robert, *younger of Cairngall*	1829

I

	INNES, Sir Hugh, *of Lochalsh,* Bart. M. P.	1802
	Inglis, James P. late Merchant, *Leith*	1806
	Inglis, John, *of Redhall*	1825
830	Inglis, William, *of Middleton*	1794
	Innes, Gilbert, *of Stow,* Treasurer of the Society	1799
	Innes, James Rose, *of Netherdale,* Advocate	1827
	Innes, Robert, *younger of Thrumster*	1824
	Irvine, Patrick, *of Inveramsay,* writer to the Signet	1827
	Irving, George, Merchant, *London*	1813
	Izett, Chalmers, *late of Kinnaird*	1808

J

	JARDINE, Sir William, *of Applegirth,* Bart.	1823
	JARDINE, Sir Henry, *of Harwood,* King's Remembrancer of Exchequer	1799

		Admitted
	Jameson, James, *of Drums*	1829
840	Jameson, Robert, Professor of Mineralogy and Natural History, in the University of Edinburgh	1820
	Jameson, Robert, Advocate	1815
	Jamieson, Robert, W. S.	1803
	Jardine, James, Civil Engineer, *Edinburgh*	1818
	Jardine, Thomas, *Moffat*	1829
	Johnson, George, Factor to the Earl of Eglinton,	1822
	Johnson, John, Writer, *Edinburgh*	1823
	Johnston, Alexander, W. S.	1819
	Johnston, George jun., *St Cuthbert's Street*, *Edinburgh*	1828
	Johnston, Henry, Surgeon, *Edinburgh*	1798
850	Johnston, James, *of Straiton*	1823
	Johnston, James Raymond, *of Alva*	1796
	Johnston, James, *younger of Alva*	1828
	Johnstone, John James Hope, *of Annandale*	1824
	Johnston, John, Landsurveyor	1806
	Johnston, Peter, *of Cairnsalloch*	1803
	Johnston, Robert, Merchant, *Edinburgh*	1813
	Johnstone, Thomas, *of Underwood*, S. S. C.	1812
	Johnstone, Walter, *of Chapplegill*	1829
	Johnstone, William, Merchant, *Greenock*	1825
860	Johnstone, William, *of Holmeadow*	1810
	Jollie, Walter, W. S.	1829
	Jolly, David Leitch, *Grange Elcho*	1829
	Jolly, Stewart, Chamberlain to His Grace the Duke of Montrose	1827
	Jopling, Thomas, *Coldstream*	1823

K

	KINNOUL, The Right Honourable Thomas, Earl of	1806
	KINTORE, The Right Hon. Anthony, Earl of	1826
	KENMURE, The Right Hon. John, Viscount	1828
	KELBURNE, The Right Hon. James Viscount	1822
	KERR, The Right Honourable Lord Robert	1808
870	KINLOCH, Sir David, *of Gilmerton*, Bart.	1828
	KEIR, Major-General Sir William Grant,	1804
	KEITH, Sir Alexander, *of Ravelstone*, Knight Marischall	1809
	Keay, James, *of Snago*, Advocate	1806
	Keir, Patrick Small, *of Kinmonth*, Advocate	1805
	Keith, William, Accountant *in Edinburgh*	1821
	Kennedy, T. F. *of Dunure*, M. P.	1812

No.		Name	Admitted
		Ker, James, *of Blackshiels*	1825
		Kerr, John, *of Kerfield*, W. S.	1805
		Kerr, Robert, Surgeon, *Portobello*	1816
880		Kerr, William, Merchant, *Leith*	1801
	*	Kerr, William, retired Secretary-General of Post-Office	1789
		Kidd, Alexander, Proc. Fiscal of the Court of Admiralty	1824
		Kilgour, Robert jun., *of Millbank*	1826
		Kincaid, John Lennox, *younger of Kincaid*	1824
		Kinloch, George, *younger of Kinloch*, Advocate	1825
		Kinloch, John, *of Kilrie*, Lieutenant 2d Life Guards	1829
		Kinnear, Charles, *of Kinnear*	1824
		Kinnear, George, Banker, *Edinburgh*	1803
		Kinnear, Patrick, *younger of Lochton*	1823

L

No.		Name	Admitted
890	†	Lothian, The Right Hon. John William, Marquis of	1821
		Lauderdale, The Right Honourable James, Earl of, K. T.	1789
		Leven and Melville, Right Honourable David, Earl of,	1820
		Lyndoch, Right Hon. Lieut. Gen. Thomas, Lord, G.C.B.	1803
		Livingstone, Sir Thomas, *of West Quarter*, Bart.	1815
		Lawrie, Sir Robert, *of Maxweltown*, Bart.	1828
		Lauder, Sir Thomas Dick, *of Fountainhall*, Bart.	1827
		Lockhart, Sir C. Macdonald, *of Lee and Carnwath*, Bart.	1817
		Liston, Right Hon. Sir Robert, *of Listonshiels*, G. C. B.	1806
		Leith, Colonel Sir Alexander, *of Freefield*	1811
900		L'Amy, James, *of Dunkenny*, Sheriff of Forfarshire	1806
		Laidlaw, James, W. S.	1794
		Laing, Rev. Francis, Rector of Langmais, *Glamorganshire*	1824
		Lamond, James, *of Stranduff*	1827
		Lamond, Peter, Brewer, *Edinburgh*	1820
		Lamont, Alexander, *younger of Knockdow*, W. S.	1819
		Lamont, James, *of Knockdow*	1791
		Lamont, James, *Howard Place, Edinburgh*	1824
		Lang, Alexander, *younger of Overton*	1801
		Laurie, Thomas, Land Valuator, *Edinburgh*	1829
910		Laurie, William Kennedy, *of Woodhall*	1827
		Lawrenson, Lieut. Col. John, *of Inverighty*	1800
		Lawson, Robert, *of Ballimore*	1813
		Learmonth, John, Merchant, *Edinburgh*	1814
		Learmonth, Thomas, *of Lawrence Park*	1824
		Legh, Rev. Peter, *Golborne Park, Lancashire*	1823
		Legh, Thomas, M. P. *Lyme, Cheshire*	1823

		lmitted
	Leitch, Quintin, Chief-Magistrate of Greenock	1819
	Leslie, George, *of Rothie*	1826
	Leslie, H. G. *of Denlugas*	1826
920	Leslie, William, *of Warthill*	1826
	Leny, James Macalpine, *of Dalswinton*	*1824
	Limond, Col. James, late Madras Artillery	1828
	Lindsay, Lieutenant-Colonel James, *younger of Balcarras*, M. P.	1823
	Lindsay, John. Corn Merchant, *Dundee*	1826
	Lindsay, Patrick, Wine-merchant, *Leith*	1823
	Lindsay, Lieutenant-Colonel Martin, 78th Regiment	1816
	Linning, Michael, *of Colzium*, W. S.	1804
	Loch, James, M. P.,	1822
	Loch, William, *of Rachan*	1824
930	Lockhart, Colonel Elliot, *of Borthwickbrae*, M. P.	1806
	Lockhart, Norman, *of Greenaton*	1815
	Lorimer, James, *of Kellyfield*, Factor to the Right Hon. the Earl of Kinnoul	1826
	Lorraine, Lieut. Col. A., Dep. Gov. South Sea Castle	1827
	Lothian, Edward, Advocate	1805
	Louson, David, Town-Clerk of Arbroath	1813
	Low, David, *of Laws*	1825
	Lumsden, Benjamin, *of Kingsford*	1828
	Lumsden, Harry Leith, *of Auchindoir*	1822
	Lumsden, Hugh, *of Pitcaple*, Advocate, Sheriff of Sutherlandshire	1825
940	Lundie, Archibald, W. S.	1796
	Lyall, Robert, Factor to Sir J. Carnegie, *of Southesk*, Bart.	1826
	Lyon, George, *of Glenogle*	1809
	Lyon, John, High School, *Leith*	1824

M

*	MONTROSE, His Grace James, Duke of, K. G.	1785
†	MORTON, The Right Hon. George Sholto, Earl of	1828
†	MORAY, The Right Honourable Francis, Earl of, K. T.	1793
†	MANSFIELD, The Right Honourable William Earl of	1803
	MINTO, The Right Honourable Gilbert, Earl of,	1808
†	MELVILLE, The Right Hon. Robert, Viscount, K. T., First Lord of Admiralty	1798
950	MONTAGUE, The Right Honourable Henry James, Lord	1801
	MACDONALD, The Right Hon. Godfrey Bosville, Lord	1796

		Admitted
	MURRAY, Lieut. Gen. The Right Hon. Sir George, G. C. B., M. P., His Majesty's Prin. Sec. of State for the Colonies	1826
	MAULE, The Hon. William Ramsay, *of Panmure*, M. P.	1805
	MACDONALD, Honourable Archibald	1796
	MACDONALD, Honourable Dudley	1803
	MACKENZIE, The Hon. Mrs Stewart, *of Seaforth*	1816
	MEADOWBANK, The Honourable Lord	1800
	MACKENZIE, The Honourable Lord	1803
	MEDWYN, The Honourable Lord	1802
960	MAITLAND, Lieut. Gen. The Hon. W. Mordaunt	1827
	MACINTOSH, the Honourable Angus, of Macintosh, Captain of *Clanchattan*	1829
	MENZIES, Sir Neil, of Menzies, Bart.	1802
	MURRAY, Sir P. *of Ochtertyre*, Bart., Baron of Exchequer	1793
	MACKENZIE, Sir George S. *of Coul*, Bart.	1801
	MAXWELL Major-Gen. Sir William, *of Monreith*, Bart. M.P.	1803
	MAXWELL, Sir John, *of Pollok*, Bart.	
	MAXWELL, Sir John Shaw Heron, *of Kerochtrie and Springkell*, Bart.	1803
	MONCRIEFFE, Sir David, *of Moncrieffe*, Bart.	1820
	MACKENZIE Sir Francis Alexander, *of Gairloch*, Bart.	1824
970	MACKENZIE, Sir James Wemyss, *of Scatwell*, Bart. M. P.	1817
	MONTGOMERY, Sir George, *of Macbiehill, Bart.*	1805
	MACGREGOR, Sir Evan Murray, *of Macgregor*, Bart.	1801
	MONTGOMERY, Sir James, of Stanhope, Bart. M. P.	1801
	MAXWELL, Sir David, *of Cardoness*, Bart.	1810
	MACKENZIE, Sir Alexander Muir, *of Delvine*, Bart.	1784
	MACDONALD, Sir James, Bart., M. P	1805
	MARJORIBANKS, Sir John, *of Lees, Bart.*	1814
	MILNE, Admiral Sir David, K. C. B.	1808
	Macadam, John, *of Blairover*	1824
980	Macalister, Alexander, *of Strathaird*	1789
	Macalister Angus, *of Balnakiel*	1821
	Macalister, Charles S., *of Kennox*	1806
	Macalister, Captain James, *of Springbank*, 13th Dragoons	1807
	Macalister, Keith Macdonald, *Ardincaple*	1829
	Macalister, Coll. Matt. *of Rosehill*	1797
	Macallan, James, W. S.	1823
	Macandrew, George, *at Torrick*	1809
	Macarthur, Dr Peter, *of Delnies*,	1819
	Macartney, Alexander, Manager Commercial Banking Company	1823

		Admitted
990	Macbean, Æneas, W. S.	1812
	Macbean, Duncan, *of Tomatin*, Merchant, *Glasgow*	1828
	Macbean, Lieut. Col. James, late 78th Regiment	1806
	Macbraire, James, *of Fishwick and Tweedhill*	1819
	Maccaskill, Captain Kenneth, *of Rudunan*	1821
	Maccheyne, Adam, W. S.	1819
	Maccormick, Samuel, Advocate, Sheriff-depute of Buteshire	1819
	Maccorquodale, Hugh, Merchant, *Liverpool*	1803
	Maccrummen, Donald, Merchant, *Leith*	1821
	Maccrummen, Captain John, 11th Regiment of Foot,	1821
1000	Macculloch, John, *of Barholm*	1810
	Macdiarmid, John, *Dumfries*	1827
	Macdonald, Alexander, *of Rhue*	1824
	Macdonald, Captain Alexander, Royal Horse Artillery	1810
	Macdonald, Colonel Alexander, late 74th Regiment	1793
	Macdonald, Lieutenant-Colonel Alexander, 76th Regiment	1811
	Macdonald, Captain Angus, *of Milltown*	1798
	Macdonald, Angus, *younger of Glenalladale*	1827
	Macdonald, Anthony, *of Lochgarry*	1819
	Macdonald, Coll, *of Dalness*, W. S.	1790
1010	Macdonald, Lieut. Col. D. Robertson, *of Kinlochmoidart*	1805
	Macdonald, Major Donald, *of Ardmore*	1822
	Macdonald, Captain Donald, Royal Engineers	1817
	Macdonald, Donald, *of Craigruie*	1829
	Macdonald, Captain Gilbert, late of the Scots Royals	1816
	Macdonald, Hugh, *of Boisdale*	1820
	Macdonald, Captain James, *at Culnakyle*	1819
	Macdonald, James, *younger of Dalness*, Advocate	1822
	Macdonald, Rev. James, *of Kinnairdy*	1826
	Macdonald, James, Merchant, *Edinburgh*	1828
1020	Macdonald, John, *of Glenalladale*	1804
	Macdonald, John, *of Sanda*	1811
	Macdonald, Captain John, *of Springfield*	1797
	Macdonald, Lieutenant-Colonel John, *of Kingsburgh*	1797
	Macdonald, Lieut. Col. John, *of Dalchoisnie*, 92d Regiment	1819
	Macdonald, Matthew N., W. S.	1818
	Macdonald, Norman, *of Barnisdale*	1789
	Macdonald, Major R. 92d Reg. late Military Sec. *Jamaica*	1823
	Macdonald, Ranald, *of Bornish*	1806
	Macdonald, Reginald George, *of Clanranald*	1807
1030	Macdonald, Reginald, *of Staffa*, Sheriff of Stirlingshire, Principal Secretary of the Society	1796
	Macdonald, Major Robert, Royal Horse Artillery	1814

		Admitted
	Macdonald, Thomas, *Fort William*	1827
	Macdonald, William, *of St Martins*	1802
	Macdonald, Major William, *of Calley,*	1813
	Macdonald, William, *of Ballyshare*	1818
	Macdonell, Colonel James, Coldstream Guards	1803
	Macdonell, James, *of Milnefield,* W. S.	1812
	Macdonell, Captain John, *Killyhonet, Fort-William*	1821
	Macdoual, Colonel Andrew, *of Logan*	1801
1040	Macdouall, Lieut. Col. *of Stranraer*	1824
	Macdougall, Allan, W. S.	1829
	Macdougal, Archibald, *of Belfast, Ireland*	1827
	Macdougal, Colin, *of Lunga*	1808
	Macdougal, Dugald, *of Gallanich*	1814
	Macdougal, Geo. *Edinburgh*	1813
	Macdougall, John, *of Macdougall,* Captain R. N.	1821
	Macdougal, Major Patrick, *of Soroba*	1800
	Macdowal, William, *of Woolmet*	1810
	Macduff, Alexander, *of Bonhard*	1811
1050	Maceachern, Captain Colin, *of Oatfield*	1825
	Macfarlane, Alexander, *of Thornhill*	1825
	Macfarlane, Duncan, Advocate	1806
	Macfarlane, John, *of Muckroy*	1821
	Macfarlane, John Fletcher, Surgeon, *Edinburgh*	1823
	Macfarlane, Thomas, *Strachurmore*	1829
§	Macfarlane, William, W. S.	1784
	Macfie, John, Merchant, *Leith*	1823
	Macfie, William, *younger of Langhouse,* merchant, *Greenock*	1826
	Macgillivray, Simon, Merchant, *London*	1821
1060	Macgillivray, William, *Jamaica*	1817
	Mackgill, David Maitland, *of Rankeilour*	1826
	Macgoune, Robert, *of Mains*	1824
	Macgregor, Alexander jun., *Glasgow*	1823
	Macgregor, Captain Charles, *at Delavorar*	1818
	Macgregor, Major Hugh, late 91st Regiment	1814
	Macgregor James, *of Fonab*	1822
	Macgregor, Major-General Murray, Bengal Cavalry	1801
	Macinnes, James, S. S. C.	1812
	Macinnes, John, *at Dandaleith*	1822
1070	Macinroy, James, *of Lude*	1823
	Macinroy, William, *of Shierglas*	1827
	Macintosh, Lieut. Col. J. J., *of Far,* Madras Artillery	1823
	Macintosh, William, *Geddes*	1816
	Macintosh, William, *of Millbank*	1813

		Admitted
	Mackintosh, Lieut.-Col. A. Hon. East India Comp. Service	1820
	Mackintosh, Angus, *of Holm*	1814
	Mackintosh, Donald, W. S.	1816
	Mackintosh, Donald, *Edinburgh*	1816
	Mackintosh, Lachlan, *of Raigmore*	1814
1080	Mackintosh, Simon F., W. S	1821
	Macintyre, Donald, *late of Pitnacree*	1803
	Macintyre, Donald, Writer, *Glasgow*	1818
	Macivor, John *of Ardmarnock*	1827
	Mackay, Major Colin Campbell, *of Bighouse*	1808
	Mackay, James, Goldsmith, *Edinburgh*, the Society's Jeweller and Medalist	1804
	Mackay, Kenneth, *of Torboll*	1805
	Mackean, John, Manager of the Scot. Life Assur. Comp.	1822
	Mackellar, Reverend Angus, Minister of Pentcaitland	1818
	Mackellar, Duncan, Merchant, *Glasgow*	1809
1090	Mackenzie, Alexander, *of Woodside, Inverness*	1802
	Mackenzie, Alexander, Sheriff-Substitute of Ross-shire	1805
	Mackenzie, Alexander, *of Hilton*	1807
	Mackenzie, Alexander, Writer, *Perth*	1829
	Mackenzie, Colin, *of Portmore*	1792
	Mackenzie, Colin, *of Kilcoy*	1801
	Mackenzie, Major Forbes, *of Fodderty*	1829
	Mackenzie, George Falconer, *of Allangrange*	1819
	Mackenzie, George Ross, *of Aldie*	1819
§	Mackenzie, Henry, Comptroller of Taxes	1784
1100	Mackenzie, James William, *of Pittrichie*	1825
	Mackenzie, John W. Pitt Muir, *younger of Delvin*	1829
	Mackenzie, John, Agent at Inverness for the Bank of Scotland	1809
	Mackenzie, John, Writer, *Edinburgh*	1813
	Mackenzie, John Hay, *of Cromertie*	1822
	Mackenzie, John Whiteford, W. S.	1821
	Mackenzie, J. A. Stewart, *of Seaforth*	1803
	Mackenzie, Kenneth Francis, *late of Park Place, Edinburgh*	1811
	Mackenzie, Murdo, *of Ardross*	1799
	Mackenzie, Richard, *of Dolphington*, W. S. Depute-Keeper of the Signet	1809
1110	Mackenzie, Sutherland, Manager of the Scottish Union Insurance Company	1808
	Mackenzie, Thomas, *of Applecross*	1816
	Mackenzie, William, *of Pitlundy*	1801
	Mackenzie, William, *of Muirton*, W. S.	1803

		Admitted
	Mackenzie, William, *late of Calcutta*	1818
	Mackinlay, John, *of Rothesay*	1818
	Mackinnon, Alexander Kenneth, *of Skalisaig*	1827
	Mackinnon, Dr Farquhar, *of Kyle*	1819
	Mackinnon, Reverend John, Minister of Slate	1815
	Mackinnon, Neil, *of Demerara*	1819
1120	Mackinnon, William Alexander, *of Mackinnon*	1811
	Maclachlan, Colin, Merchant, *Glasgow*	1806
	Maclachlan, Robert, *of Maclachlan*	1817
	Maclaggan, Dr Henry, F. R. C. P. E.	1813
	Maclaine, Murdoch, *of Lochbuy*	1811
	Maclarty, Colin, *late of Jamaica*	1808
	Maclaurin, Malcolm, *Oban*	1803
	Maclean, Colonel Alexander, *of Ardgower*	1793
	Maclean, Alexander, *of Coll*	1785
	Maclean, Archibald, *younger of Ardgower*, Capt. R. N.	1827
1130	Maclean, Donald, *of Borera*	1822
	Maclean, Donald, W. S.	1793
	Maclean, Hugh, *younger of Coll*	1809
	Maclean, Hugh. *late of Jamaica*	1827
	Maclean, John, *of Killunden*	1822
	Maclean, Dr Lachlan, Principal Tacksman of Rum	1823
	Macleod, Alexander, Chamberlain to Lord Macdonald, *Skye*	1829
	Macleod, Alexander, *of Canada*	1811
	Macleod, Alexander Norman, *of Harris*	1817
	Macleod, Alexander, *of Muiravonside*	1800
1140	Macleod, Charles Murray, Advocate	1821
§	Macleod, Donald, *of Geanies*, Sheriff of Ross-shire	1784
	Macleod, Donald, *of Talisker*	1800
	Macleod, Eneas R. B., *of Cadboll*	1786
	Macleod, Captain Neil, *Gesto*	1799
	Macleod, Major-General John, *of Unish*,	1804
	Macleod, John Norman, *of Macleod*, M. P.	1806
	Macleod, Mrs, *of Macleod*	1816
	Macleod, Roderick, *younger of Cadboll*	1807
	Macleod, Colonel William, Hon. East India Company's service	1817
1150	Macmillan, Donald, *of Lephenstrath*	1825
	Macmillan, Capt. Iver, of the Valentine Indiaman	1798
	Macmillan, Michael, Merchant, *Glasgow*	1810
	Macmillan, Robert, *of Polbae*, W. S.	1809
	Macmillan, Thomas, *younger of Shorthope*, W. S.	1817

		Admitted
	Macnab, Archibald, *of Macnab*	1806
	Macnab, Colin, *of Suie*	1809
	Macnair, James, *of Glasgow*	1815
	Macneale, George, *of Ugadale*	1825
	Macneil, Lieutenant-Colonel Donald, late 91st Regiment	1802
1160	Macneil, Hector Frederick, *of Gallochilly*	1812
	Macneil, John, *of Oakfield*	1796
	Macneil, Colonel Roderick, *of Barra*	1817
	Macneill, Alex. Collector of Customs, *Stranraer*	1829
	Macpherson, Allen, 2 *Harley Place, New Road, London*	1822
	Macpherson, Allen, *Kingussie*	1821
	Macpherson, Colonel Duncan, Hon. E. I. C. S.	1825
	Macpherson, Ewen, *of Cluny Macpherson*	1827
	Macpherson, Hugh, *of Eigg*, M. D. one of the Professors of King's College, Aberdeen	1828
	Macpherson, James, *of Arderseir*	1802
1170	Macpherson, John, Factor for Lovat	1809
	Macpherson, Kenneth, Member of the Hon. House of Assembly, Jamaica	1826
	Macpherson, William, *of Blairgowrie*	1822
	Macquarrie, Lieutenant-Colonel Charles, *of Glenforsa*	1796
	Macqueen, Captain, *lately residing at Corrybrough*	1820
	Macqueen, Hugh, W. S.	1816
	Macra, Archibald, *of Ardintoul*	1802
	Macrae, Colin, *of Demarara*	1823
	Macritchie, John, *of Craigton*	1795
	Macritchie, Thomas, Merchant, *Leith*	1805
1180	Macturk, Robert, *younger of Stenhouse*	1826
	Macvicar, Major Charles, late of the 42d Regiment	1796
	Macvicar, John, *of Kierfield*	1823
	Macvicar, Rev. J. G. Lecturer on Natural History in the University of St Andrews	1828
	Maidment, James, Advocate	1824
	Mair, Colonel Alexander, Lieut. Gov. of Fort George	1824
	Maitland, Adam, *of Dundrennan*	1802
	Maitland, William, *of Aucklane, Gelston Castle*	1825
	Malcolm, Neil, *Poltaloch*	1804
	Mansfield, John, *of Midmar*	1827
1190	Mansfield, Thomas, Accountant, *Edinburgh*	1827
	Marjoribanks, Alexander, *of Marjoribanks*	1800
	Marshall, Claud, Sheriff-substitute of Greenock	1819
	Marshall, David, *of Neilsland*	1828
	Marshall, John, Advocate	1822

		Admitted
	Massie, W. W. Hon. East India Comp. Civil Service	1816
	Masterton, James *of Braco*	1824
	Mathie, David, *Glasgow*	1809
	Matheson, Duncan, Advocate	1821
	Maxton, Anthony, *of Cultoquhey*	1812
1200	Maxwell, James, *Mull*	1803
	Maxwell, John, *younger of Pollock*, M. P.	1825
	Maxwell, John Herries, *of Munches*	1826
	Maxwell, Lieut. Col., *of Orchardtown and Gretna*	1825
	Maxwell, General William, *Edinburgh*	1804
	May, John, *of Bradfield*, Merchant, *Glasgow*	1827
	Meek, George, *of Campfield*	1814
	Megget, Thomas, W. S.	1811
	Melville, John Whyte, *of Mount-Melville*	1819
	Menteith, Charles Granville Stewart, *of Closeburn*	1803
1210	Menzies, Archibald, late Merchant, *Edinburgh*	1799
	Menzies, Major Archibald, late of the 42d Regiment	1817
	Menzies, Joseph Stewart, *of Foss*	1803
	Menzies, John, Cashier to the Duke of Gordon	1804
	Menzies, John, *of Pitfoddels*	1806
	Menzies, John, *of Chesthill*	1821
	Menzies, Robert, W. S., Depute Clerk of Session	1798
	Menzies, Robert, Land-surveyor, *Aberfeldy*	1829
	Mercer, George, *of Gorthy*	1822
	Mercer, Græme, *of Mavisbank*	1819
1220	Mill, George, *of Blair*	1826
	Mill, John, *merchant, Edinburgh*	1814
	Milne, David, *Aberdeen*	1826
	Millar, Andrew, Merchant, *Edinburgh*	1827
	Miller, Alexander, *of Dalnair and Ernock*	1825
	Miller, George, *of Frankfield*	1814
	Miller, Thomas Hamilton, *Advocate*	1804
	Miller, Patrick, *Dalswinton*	1806
	Miller, William, *of Monkcastle*, Advocate	1828
	Mitchell, Colonel James, late of the 92d Regiment	1821
1230	Mitchell, William, *of Gordonhall*	1821
	Mitchell, William, *of Parsons Green*	1819
	Molle, William, *of Mains*, W. S.	1802
	Moodie, Major James *of Melsetter*	1801
	Moore, Colonel Archibald, Vice-Lieutenant of Buteshire	1810
	Moore, James Carrick, *of Corsewell*	1829
	More, John Shank, *Advocate*	1816

		Admitted
	Moir, Charles Alexander, *of Leckie*	1814
	Moir, John, Printer, *Edinburgh*	1804
	Moir, Walter, Sheriff-substitute, *Glasgow*	1803
1240	Moncrieff, Robert Hope, *Perth*	1825
	Monro, Dr Alex. Prof. of Anatomy in the Univ. of Edin.	1807
	Montgomery, Robert, Lord Treasurer's Remembrancer	1829
	Monteith, Henry, *of Carstairs*	1808
	Monypenny, Alexander, W. S.	1827
	Moray, James, *of Abercairney*	1811
	Moreland, Charles, Banker, *Stranraer*	1827
	Morison, John, *of Auchintoul*, M. P.	1825
	Morison, John, W. S.	1818
	Morison, Theodore, *of Bognie*	1798
1250	Morton, Samuel, Agricultural Implement-maker, *Leith Walk*	1822
	Morton, Robert, Jeweller, *Edinburgh*	1812
	Mowat, William, *Garth*	1807
	Mowbray, John, *of Cambus*	1825
	Mowbray, Rear-Admiral R. H., *of Cockairney*, C. B.	1827
	Moyes, Reverend Laurence, Minister of Forglen	1820
	Muir, Andrew, Merchant, *Greenock*	1826
	Muir, James, Merchant, *Greenock*	1827
	Muirhead, Claud, Publisher of the Edinburgh Advertiser,	1820
	Mundell, Alexander, Solicitor, *London*	1805
1260	Munro, Hugh, *of Teaninich*	1799
	Munro, Alexander, *Prince's Street, Edinburgh*	1810
	Munro, Lieut. Col. Commandant William, Madras Army	1825
	Murdoch, John Burn, *of Gartincaber*	1820
	Mure, James O. Lockhart, *of Livingstone*	1828
	Mure, Colonel William, *of Caldwell*	1804
	Murray, Alexander, *of Broughton*	1822
	Murray, Andrew, *of Murrayshall*, Sheriff of Aberdeenshire	1804
	Murray, Anthony, *of Crieff*	1818
	Murray, Anthony, *younger of Dollcrie*, W. S.	1828
1270	Murray, James, of the Monkland Iron Works	1828
	Murray, John Archibald, Advocate	1823
	Murray, John Dalrymple, *of Murraythwaite*	1825
	Murray, John, W. S.	1811
	Murray, Joseph, *of Ayton*	1820
	Murray, Patrick, *of Simprim*,	1794
	Murray, Colonel Robert Macgregor	1799
	Murray, William, *of Polmaise*	1806
	Murray, William, Banker, *Tain*	1817
	Murray, William, *of Banknock*	1827

		Admitted
1280	Murray, William, *of Henderland*,	1826
	Mutrie, David, Merchant, *Glasgow*	1804
	Mylne, Thomas, *of Mylnefield*	1826

N

	NORTHLAND, The Right Honourable Thomas, Viscount	
	NAPIER, The Right Honourable William John, Lord	1818
	NAIRNE, The Right Honourable William, Lord	1813
	NAPIER, Sir William Milliken, of Milliken, Bart.	1820
	NICHOLSON, Sir Arthur, *of Lochend*, Bart.	1812
	Nairne, David, *of Drumkilbo*	1826
	Nairne, James Mellis, *of Dunsinane*	1821
1290	Nairne, James, *of Claremont*, W. S.	1829
	Napier, John, *of Mollance*	1822
	Napier, Robert Dunmore, *of Ballekinrain*	1824
	Napier, William, *of Blackstone*	1815
	Neil, Major William, *of Barweill*	1824
	Neill, Patrick, Secretary Caledonian Horticultural Society	1808
	Newton, Abraham, Merchant, *Leith*	1828
	Nicholson, Major Allan Macdonald, *of Ardmore*	1819
	Nisbet, Archibald, *of Carphin*	1820
	Nisbet, George More, *of Cairnhill*	1817
1300	Niven, John, *of Thornton*	1805
	Niven, Robert William, W. S.	1823
	Niven, William, *of Achalton and Kirkbride*	1812

O

	OGILVIE, The Honourable William, *of Airly*	1823
	OGILVIE, The Honourable Donald, *of Clova*	1824
	OGILVIE, Sir John, *of Inverquharity*, Bart.	1824
	OSWALD, Lieutenant-Gen. Sir John, *of Dunnikier*, G. C. B.	1824
	Ochterlony, John, *of Guynd*	1797
	Ogilvie, Captain William, R. N.	1820
	Ogilvie, William, *younger of Chesters*, Advocate	1809
1310	Oliphant, Charles, W. S.	1813
	Oliphant, Laurence, *of Condie*	1828
	Oliphant, James, *of Gask*	1828
	Oliver, Thomas, *Lochend*	1825
	Oliver, William, *of Dinlabyre*, Sheriff of Roxburghshire	1825
	Orr, Charles James Fox, *of Thornly Park*, W. S.	1816
	Orr, Patrick, W. S.	1825

		Admitted
	Osborne, Alexander, retired Commissioner of Customs	1805
	Oswald, James, *of Shieldhall*	1829
	Oswald, Richard Alexander, *of Auchencruive*	1803
1320	Oswald, Lieutenant-Colonel Robert, *at Dunnikier*	1824

P

	PITMILLY, The Honourable Lord	1804
	PRINGLE, Sir John, *of Stitchell*, Bart.	1810
	Pagan, William, *of Linburn*	1800
	Parish, Woodbine, late Chairman of the Board of Excise	1819
	Parkes, Samuel, *of London*	1817
	Parkynes, Thomas Boultbie, *of Oakhouse, Gloucestersh.*	1826
	Paterson, Alexander, *Thurso*	1801
	Paterson, George, *of Castle Huntly*	1804
	Paterson, John, factor to the Duke of Hamilton in Arran,	1826
1330	Patison, John, W. S.	1806
	Patrick, Robert, *of Trearne and Hazlehead*	1801
	Patrick, William, *of Roughwood*, W. S.	1805
	Paul, William, Accountant, *Edinburgh*	1829
	Pearson, Alexander, W. S.	1819
	Peat, Thomas, W. S.	1820
	Pedie, James, W. S.	1819
	Pedie, William, Writer, *Perth*	1828
	Pennycuick, John, *younger of Soilarie*	1823
	Peter, John, *Keithick House*	1828
1340	Peterkin, John G., *of Grange*	1826
	Philp, John, Distiller, *Dolls*	1828
	Pillans, James, Merchant, *Leith*	1799
	Pitcairn, John, *of Pitcairns*	1815
	Playfair, William Henry, Architect, *Edinburgh*	1824
	Pollock, Arthur, Merchant, *Grangemouth*	1815
	Pringle, Alexander, *of Whytbank*	1821
	Pringle, James, *of Torwoodlee*	1806
	Pringle, Captain James, R. N. *younger of Torwoodlee*	1820
	Pringle, John, *of Clifton*	1819
1350	Prentice, Richard, Solicitor-at-law	1817
	Proctor, William, D. *of Halkerton*	1829

Q

†	QUEENSBERRY, The Most Noble Charles, Marquis of, K. T.	1799

R

		Admitted
	† ROSEBERY, The Right Honourable Archibald John, Earl of	1806
	† ROSSLYN, The Right Honourable James, Earl of, G. C. B. Lord Privy Seal,	1787
	REAY, The Right Honourable Eric, Lord	1800
	RUTHVEN, The Right Honourable James, Lord	1810
	ROBERTSON, The Honourable Lord	1798
	RATTRAY, The Hon. Baron Clerk	1812
	RAE, The Right Hon. Sir William, Bart. Lord Advocate of Scotland	1802
1360	RAMSAY, the Honourable Colonel John, *of Dysart*	1824
	RAMSAY, Sir James, *of Bamff*, Bart	1823
	RIDDELL, Sir James Mills, *of Sunart*, Bart.	1808
	RAMSAY, Sir Alexander *of Balmain*, Bart.	1813
	RADCLIFFE, Sir Joseph, Bart. *of Millsbridge, Yorkshire*	1820
	Rae, John, Factor at Graemsay	1804
	Ramsay, Alexander, *of Demerara*	1806
	Ramsay, John, *of Barra*	1813
	Ramsay, Robert, W. S.	1825
	Ramsay, R. Wardlaw, *of Whitehill and Tilliecoultry*	1828
1370	Ramsay, Captain Thomas, *Balbegno Castle*	1828
	Rattray, Robert, W. S.	1805
	Rattray, Robert Clerk, *younger of Craighall Rattray*, Advocate	1826
	Reid, Gabriel, *of Kilcalmkill*	1820
	Reid, George, *late of Ratho Bank*	1813
	Reid, John, Merchant, Leith	1813
	Reid, Sylvester, W. S. Depute Clerk of Teinds	1821
	Rennie, John, *of Phantassie*	1822
	Renny, Robert Walker, Factor on the estate of Pitfour,	1827
	Renny, William, W. S. Solicitor of Legacy Duties	1820
1380	Reoch, James, Merchant, *Leith*	1826
	Richardson, John, *of Pitfour*	1823
	Richardson, Ralph, Merchant, *Edinburgh*	1828
	Riddell, Campbell D., Advocate	1816
	Riddell, John, Advocate	1817
	Rigg, J. Home, *of Morton and Downfield*	1824
	Ritchie, Henry, *of Busbie*	1820
	Robertson, Alexander, W. S.	1825
	Robertson, Captain, *of Kendrochet*, late of 88th Regiment	1825

		Admitted
	Robertson, David, Agent for the British Linen Company, *Perth*	1829
1390	Robertson, Captain George, of the Honourable East India Company's Service	1817
	Robertson, George, one of the Keepers of the General Records of Scotland	1819
	Robertson, James Stewart, *of Edradynate*	1811
	Robertson, James Saunders, W. S.	1816
	Robertson, Captain James Walker, R. N.	1823
	Robertson, James, Iron-monger, *Edinburgh*	1812
	Robertson, Captain John, *of Tullybelton*	1797
	Robertson, Captain John, late 14th Foot	1825
	Robertson, Laurence, Cashier for the Royal Bank, *Glasgow*	1828
	Robertson, Patrick, Advocate	1816
1400	Robertson, Robert, *of Auchleeks*	1828
	Robertson, William, *younger of Kinlochmoidart*, Advocate	1826
	Robinson, George Garden, *Banff*	1811
	Robinson, William, *Banff*	1829
	Robson, Charles, *of Samieston*	1823
	Robson, Charles, jun. *at Lardenlaw*	1826
	Roger, William, Merchant, *Glasgow*	1825
	Rogerson, Dr John, *of Wamphray*	1804
	Rogerson, William, *of Gillesbie*	1829
	Rose, Hugh, *of Holm*	1823
1410	Rose, Hugh, *of Glastullich*	1824
	Ross, Charles, *of Invercarron*, one of the Commissaries of Edinburgh	1821
	Ross, Richard Louthian, *of Staffold*	1804
	Ross, Walter, *of Nigg*	1802
	Ross, William, *of Bridgebank*	1803
	Rose, William B. *of Rhynie*	1821
	Roy, John James, Factor on the estate of Invercauld	1825
	Roy, Robert, W. S.	1822
	Russel, Claud, Accountant, Auditor of Accounts to the Society	1807
	Russel, John, W. S. one of the Clerks of the Jury Court	1806
1420	Ryrie, Stewart, of the Commissariat Department	1824

S

	SUSSEX, His Royal Highness Prince Augustus Frederick, Duke of	1806
§	STAFFORD, The Most Noble Elizabeth, Marchioness of,	1784

		Admitted
	† STAFFORD, The Most Noble George Granville, Marquis of, K. G.	1787
	STRATHMORE, The Right Honourable Thomas, Earl of	1820
	STIRLING, The Right Hon. Alexander, Earl of	1825
	† STRATHALLAN, The Right Honourable James, Viscount	1811
	† SALTOUN, The Right Hon. Alexander George, Lord	1820
	SINCLAIR, The Right Hon. Charles, Lord,	1829
	STRATHAVON, The Right Honourable Charles, Lord	1819
1430	STUART, The Right Honourable Lord James, M. P.	1819
	SHEPHERD, The Right Hon. Sir Samuel, Lord Chief Baron of the Court of Exchequer	1820
	† § SINCLAIR, The Right Hon. Sir John, *of Ulbster*, Bart.	1784
	SINCLAIR, Major The Hon. James, M. P.	1824
	STEWART, Major-General The Hon. William	1826
	STEWART, The Hon. Charles	1826
	STUART, the Hon. John, M. P.	1824
	STIRLING, Sir Samuel, *of Glorat*, Bart.	1809
	STEWART, Sir M. Shaw *of Greenock and Blackhall*, Bart. M. P.	1814
	SCOTT, Sir William, *of Ancrum*, Bart. M. P.	1829
1440	STEWART, Sir John Archibald, *of Grandtully*, Bart.	1782
	STIRLING, Sir Gilbert, *of Rosehall*, Bart.	1806
	STEUART, Sir Henry, *of Allanton*, Bart.	1802
	SCOTT, Sir Walter, of Abbotsford, Bart.	1815
	Sandeman, David George, *of Springland*	1810
	Sanders, James, M. D. *Edinburgh*	1818
	Sanderson, Patrick, Banker, *Edinburgh*	1819
	Sandford, Erskine Douglas, Advocate	1827
	Sands, James, *at Blarcessnock*	1817
	Sands, William J., H. E. I. C. Civil Service, *Bengal*	1829
1450	Savigny, John Horatio, *Upper Braid*	1823
	Scarth, James, Merchant, *Leith*	1828
	Sceales, Andrew, of the Customs, *Leith*	1828
	Scott, Alexander, of the Iron Foundry, Dumfries	1826
	Scott, Alexander, of Trinity Mains, W. S.	1818
	Scott, Charles B. *of Woll*, W. S.	1826
	Scott, David, of Bengal Civil Service	1823
	Scott, Lieutenant-Colonel George, *Edinburgh*	1821
	Scott, George Robertson, *of Benholm and Hedderwick*	1823
	Scott, Henry Francis, *younger of Harden*, M. P.	1829
1460	Scott, James, *of Brotherton*	1805
	Scott, James, Accountant, *Edinburgh*	1817
	Scott, John Corse, *of Sinton*	1818

		Admitted
	Scott, John, *younger of Hawkhill*, Merchant, *Greenock*	1826
	Scott, Captain Robert, *of Abbethune*	1826
	Scott, Lieutenant-General Thomas, *of Malleny*	1824
	Scott, Thomas Rennie, Factor to Lord Douglas	1827
	Scrymsour, James Fothringham, *of Tealing*	1829
	Selkrig, Charles, Accountant, *Edinburgh*	1810
	Seller, Patrick, of Westfield	1813
1470	Shairp, Major Norman, *younger of Houston*	1828
	Shand, William, *of Arnhall*	1827
	Shaw, Duncan, factor to Lord Macdonald	1815
	Shearer, James, *of Buchromb,*	1800
	Shepherd, James, W. S.	1828
	Shepperd, Alexander, Solicitor, *Inverness*	1819
	Sheriff, Charles, Sheriff-Substitute, *Orkney*	1829
	Short, Francis, *of Courance*	1804
	Simpson, Alexander, *Leith*	1828
	Simpson, Alexander, *at Helmsdale*	1821
1480	Simpson, Colonel Francis *of Plean*	1802
	Sinclair, Dugald, *Kilchamaig*	1826
	Sinclair, George, *younger of Ulbster*	1812
	Sinclair, John, *of Barrock*	1824
	Sinclair, Robert, Merchant, *Greenock*	1826
	Sinclair, William, Freswick	1811
	Singer, Reverend William, D. D. *Kirkpatrick-juxta*	1808
	Skene, Patrick George, *of Hallyards*	1825
	Skinner, C. G. Macgregor, Lieut. 1st Dragoon Guards,	1823
	Skinner, James, *at Drummin,* Factor to the Duke of Gordon	1827
1490	Sligo, George, *of Auldhame*	1827
	Sligo, John, *of Carmyle*	1827
	Small, Patrick, *of Dirnanean*	1826
	Smith, Alexander, *of Glenmillan,* Advocate, Aberdeen,	1822
	Smith, George, *Moffat,* Surgeon, R. N.	1829
	Smith, James, *of Jordanhill*	1823
	Smith, James, Manager of the Deanston Cotton-Works,	1821
	Smith, James, *of Craigend*	1825
	Smith, James, Merchant, *Leith*	1801
	Smith, John, *of Swinridgemuir*	1799
1500	Smith, Thomas, Banker, *London*	1798
	Smith, William, M. P. for Norwich, Honorary Member	1810
	Smith, William, Merchant, and late Lord Provost of Glasgow	1823
	Smollett, J. R. of Bonhill, Captain R. N.	1818
	Smollett, Alexander, *younger of Bonhill,* Advocate	1826

		Admitted
	Somerville, William, *of Sorn Castle*	1810
	Speid, Robert, *of Ardovie*	1819
	Speirs, Archibald, of Elderslie	1810
	Spens, Lieutenant-Colonel James, late 73d Regiment	1790
	Spottiswoode, John, *of Spottiswoode*	1812
1510	Sprot, Mark, *of Garnkirk*, Advocate	1820
	Sprot, Thomas, W. S.	1826
	Stavert, Thomas, *of Hosecoat*	1827
	Steele, William, Advocate	1828
	Stephens, Henry, *of Balmadies*	1826
	Stevenson, Alexander, S. S. C.	1813
	Stevenson, Duncan, Printer to the University of Edin.	1824
	Stevenson, Captain Hugh, late Argyleshire Militia	1805
	Stevenson, Robert, Civil Engineer, *Edinburgh*	1807
	Stewart, Allen, *of Bonrannoch*	1809
1520	Stewart, Alexander,*of Inverdunning*	1829
	Stewart, Alexander, *of Balnakeilly*	1811
	Stewart, Alexander, *of Dercullich*	1805
	Stewart, Captain Alexander, *of Strathgarry*	1808
	Stewart, Archibald John, *of St Fort*	1827
	Stewart, Charles Campbell, W. S.	1825
	Stewart, Charles, *of Shierglass*	1821
	Stewart, Charles, *of Hillside*	1823
	Stewart, Charles, *of Ballachulish*	1827
	Stewart, Charles, *of Ardsheal*	1794
1530	Stewart, General David, *of Garth*, C. B., Governor of St Lucia	1815
	Stewart, Donald, Factor on the estate of Harris	1817
	Stewart, Captain Dugald *of Balachulish*	1799
	Stewart, Duncan, *of Glenbuckie*	1803
	Stewart, Duncan, Writer, *Edinburgh*	1823
	Stewart, Captain Gilbert, late 61st Reg. *residing at Allean*	1819
	Stewart Hope, *of Ballechin*	1796
	Stewart, Captain Houston, R. N.	1822
	Stewart, James, Merchant, *Greenock*	1825
	Stewart, Captain James, *of Crossmount*	1821
1540	Stewart, John, *of Belladrum and Carnousie*, M P.	1819
	Stewart, John Lorne, *younger of Glenbuckie*	1824
	Stewart, John, *of Dalguise*	1823
	Stewart, John Shaw, Advocate	1816
	Stewart, John, *of Fasnacloich*	1817
	Stewart, John, *of Binny*	1809
	Stewart, John, *late of Shierglass*	1809

		Admitted
	Stewart, Captain John, of the Prince of Wales Excise Yacht	1809
	Stewart, John, *of Crossmount*	1801
	Stewart, John, *of Achadashenaig*	1824
1550	Stewart, Major Ludovick, *at Pittyvaich*	1806
	Stewart, Patrick Maxwell, Merchant, *London*	1813
	Stewart, Patrick, *of Auchlunkart*	1800
	Stewart, Patrick G., Agent for the Bank of Scotland, *Perth*	1829
	Stewart, Robert, *younger of Ardvorlich*	1823
	Stewart, Robert, *of Stewarthall*	1825
	Stewart, Robert, *of Alderston*	1828
	Stewart, Rob. *of Clockfoldich*, Dep. Rec. Gen. for Scotland	1819
	Stewart, Stair, *of Physgill*	1828
	Stewart, William, *of Ardvorlich*	1799
1560	Stewart, William, Sheriff-cerk, *Kincardineshire*	1825
	Stewart, William, *Mains of Skellater*	1829
	Stirling, Lieut.-Gen, Alex. Graham, *of Duchray and Auchyle*	1801
	Stirling, Alexander Garthshore, *of Craigbarnet*	1818
	Stirling, Charles, *of Kenmore*	1803
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	Stuart, James, *of Dunearn*	1823
	Stuart, James, S. S. C.	1822
1580	Swan, James, W. S.	1813
	Swinton, Archibald, W. S.	1800
	Swinton, John, *of Swinton*	1828
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	Swinton, Samuel, *of Allanbank*	1829
	Sym, David, *of Coultermains*	1827
	Symons, John, M. D. *Dumfries*	1829

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	TORPHICHEN, The Right Hon. James, Lord	1821
1590	TURING, Sir Robert, *of Foveran*, Bart.	1802
	Tait, Craufurd, *of Harvieston*	1800
	Tait, George, Advocate	1808
	Tait, George, *of Langrig*	1825
	Tait, John, *younger of Pirn*, W. S.	1816
	Tait, William, *of Pirn*	1814
	Tawse, John, *York Place, Edinburgh*	1799
	Tawse, John, Advocate, Secretary to the Society for propagating Christian Knowledge	1825
	Taylor, Major Alexander Francis, *Rothiemay House*	1814
	Taylor, Andrew, *Westbarns, Haddingtonshire*	1817
1600	Taylor, Robert, *Blackness*	1819
	Taylor, William, *of Troqueerholm*	1823
	Taylor, William, merchant, *Leith*	1828
	Thom, Robert, Civil Engineer, *Rothesay*	1818
	Thomson, Alexander, *of Banchory*, Advocate,	1821
	Thomson, Alexander, Banker, *Greenock*	1825
	Thomson, Andrew, *younger of Kinloch*, W. S.	1824
	Thomson, David, W. S.	1809
	Thomson, David, *of Orkie*, W. S.	1825
	Thomson, James, *younger of Earnslaw*	1828
1610	Thomson, John, Bookseller, *Edinburgh*	1811
	Thomson, John Deas, Commissioner Royal Navy	1801
	Thomson, Thomas, Advocate, Dep. Clk. Reg.	1807
	Thomson, William, *of Woodhouse*	1828
	Thorburn, John, S. S. C.	1827
	Threshie, David Scott, W. S.	1824
	Thriepland, Patrick Murray, *younger of Fingask*	1824
	Tod, George, S. S. C.	1800
	Tod, Hugh, W. S.	1817
	Tod, Peter, *of Meikleholmside*	1829
1620	Torrance, George Macmicken, *of Kilsaintninian*	1827
	Traill, George, *younger of Hobbister*	1822
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	Trotter, Captain Robert Knox, *younger of Ballindean*	1829
	Trotter, Thomas, *younger of Crooksfield*, W. S.	1828

		Admitted
	Trotter, William, *of Ballindean*	1814
	Trotter, Young, *of Crooksfield*	1828
	Turnbull, Archibald, *Perth*	1826
1630	Turnbull, George, *of Miles*	1827
	Turner, George, *of Menie*, Major Royal Horse Artillery	1828
	Turner, John, *of Turnerhall*, W. S.	1825
	Tytler, William Fraser, *of Balnain and Burdsyards*, Sheriff of Inverness-shire	1802

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	Urquhart, James, *of Meldrum*, Sheriff of Banffshire	1810
	Urquhart, John Traill, *of Ellsness, Orkney*	1823
	Urquhart, William, *of Byth*, Advocate	1820

V

	Veitch, Henry, *of Elliock*	1802
	Veitch, James, *younger of Elliock*	1822
1640	Vere, Daniel, *of Stonebyres*, Advocate	1807
	Vere, James J. Hope, *of Craigiehall*	1816
	Vyse, Lieut. Col. Richard William Howard	1804

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	WARRENDER, The Right Hon. Sir George, *of Lockend*, Bart. M. P.	1804
	WALKER, Sir Patrick, Knight, *of Coates*, Usher of the White Rod	1803
	Waddel, George, *of Ballochnie*, W. S.	1824
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1650	Waldie, Archibald, Agent for the Commercial Banking Company, *Kelso*	1824
	Waldie, John, *of Henderside Park*	1826
	Walker, James, Wine Merchant, *Leith*	1800
	Walkinshaw, Robert, *of Parkhouse*, Sheriff-clerk of Renfrewshire	1828
	Wallace, Robert, *of Kelly*	1825

		Admitted
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	Wardrope, John, Banker, *Edinburgh*	1807
	Warran, Edward Ord, *of Hoxley Hall, Essex*	1829
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1660	Watson, David, Writer, *Edinburgh*	1816
	Watson, George, Portrait Painter, *Edinburgh*	1826
	Watson, George, Sheriff-Substitute of Kincardineshire	1793
	Watson, Hugh, *at Keillor*	1828
	Watson, James, Factor to Lord Dundas	1804
	Watson, John, Manager of the Edin. Gas Light Comp.	1825
	Watson, Walter, *Charlotte Square*	1795
	Watson, William Dickson, *late of Press*	1810
	Watt, James, *of Crawfordsyke*	1825
	Wauchope, George, *Moray Place*	1824
1670	Wauchope, John, *of Edmonstone*	1813
	Waugh, John, Bookseller, *Edinburgh*	1828
	Webster, John, Agent for the British Linen Company, *Kirriemuir*	1829
	Wedderburn, Henry, S., *of Wedderburn and Birkhill*	1819
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	Weir, Mathew, W. S.	1822
	Welsh, James, *at Earlshaugh*	1826
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1680	Wemyss, William, *at Cuttlehill*	1829
	Whigham, George, *of Hallidayhill*	1816
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	White, Adam, *of Fens*, Merchant, *Leith*	1801
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	Williamson, Lieut. Col. Benjamin, *of Marlefield*	1803
1690	Williamson, Lieut. Col. David, late of the 92d Regt	1826
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	Wilson, William Rae, *of Kelvinbank*	1807
	Wilson, William, Factor for the Earl of Glasgow	1804
	Wilson, Wilson Dobie, Advocate	1827
1700	Wishart, Patrick, *of Lochcoat*, W. S.	1822
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P. NEILL, PRINTER.

PREMIUMS

OFFERED BY

THE HIGHLAND SOCIETY OF SCOTLAND,

IN

1828,

FOR PROMOTING

AGRICULTURE AND INTERNAL IMPROVEMENT
IN SCOTLAND.

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PRELIMINARY NOTICE.

THE business of THE HIGHLAND SOCIETY OF SCOTLAND is conducted by a President, Four Vice-Presidents, Thirty Ordinary and Ten Extraordinary Directors, a Treasurer, and Principal and Depute Secretaries, to which latter all communications are addressed. The Ordinary Directors are subdivided into Committees for the despatch of business, assisted occasionally by those Ordinary Members most conversant with the subjects to be discussed. The Report of each Committee is brought before the Directors collectively for farther procedure, and these proceedings are again submitted for approbation to a half-yearly General Meeting of the Society. New members are admitted at the General Meetings by ballot. They pay a small annual contribution of L. 1 : 3 : 6, or, in their option, and in full of all future claims, a life-subscription of Twelve Guineas. All Meetings of Directors, or Committees, are open; and at these, any Member may attend and deliver his opinion on the subjects under consideration, though, in cases of division, the Directors or Members of the Committees only are entitled to vote. Members have access to the Society's Library, which is annually increasing, by the purchase or donation of books connected with the purposes of the Institution.

When the Highland Society of Scotland was instituted in the year 1784, the object chiefly contemplated was the improvement of the Highlands,—and hence its name. But the great increase in the number of its Members since that time, the happy management of its funds, and the change in the general state of the country, have long enabled it to extend the design of its first institution, and direct attention to every part of North Britain where industry might be excited, or the useful arts improved.

The Society has, neither by its Charter of Incorporation, nor by its subsequent practice, been limited in its patronage to any one department of industry; but it has regarded, as the fitting objects of encouragement, every application of useful labour which might tend to the general good. But although its patronage be thus extended as regards its objects, circumstances have arisen to modify, in some cases, the application of it. The establishment of certain Boards, as that for the encouragement of the Herring Fishery, and the like, has induced the Society to restrict its original views, and to devote its attention, and apply its funds, in a more especial manner to other objects, and chiefly to Agriculture, and Rural Economy in its various branches.

In fulfilment of its purposes, the Society is every year accustomed to offer and award a variety of Premiums, as the means of eliciting and diffusing knowledge, as incitements to industry, or as the rewards for useful undertakings. These relate to every subject which may be supposed to fall within the plan of the Institution:—such are, the improvement of the Waste Lands of the Country, by Tillage, by Irrigation, or by Draining,—the Extension of Plantations, as the objects of ultimate profit, or of present embellishment and shelter,—

the improvement of the Breeds of Live Stock, and of the qualities of Wool, —the encouragement of certain domestic Manufactures,—the invention of Useful Machines,—and, not the least in interest and importance, the awakening the Industry of the Lower Ranks to such pursuits as shall promote their content, by ameliorating their condition.

Although certain subjects be thus selected as the objects of experiment or discussion, the Patronage of the Society is not restricted to these objects. Its purpose being the promotion of general industry and improvement, it receives with favour every beneficial communication and every statement of facts which may admit of an useful application. A Mechanical Department exists for rewarding the original invention or subsequent improvement of all machines and implements for Agricultural purposes, the construction of those for other branches of Rural Economy, and of some for domestic convenience. Models of these are received and preserved; and it is proposed, that, for the future, descriptions shall as speedily as possible be conveyed to the Public of all such as may merit attention.

The Transactions of the Society have hitherto been printed by Volumes, of which Six have been already published, and which may be had of Messrs Cadell and Co. of Edinburgh, successors to the interest held by Messrs Constable and Co. in the Copy-right, and by whom they will be furnished to Members at 25 per cent. under the selling price.

The Papers of the Society will hereafter appear periodically in "The Quarterly Journal of Agriculture, and the Prize Essays and Transactions of the Highland Society of Scotland," published by Mr Blackwood of Edinburgh, Mr Cadell of London, and Messrs Curry and Co. Dublin.

All Communications relating to Premiums, and other subjects for the consideration of the Directors, are to be addressed to Charles Gordon, Esq. Depute-Secretary, at the Society's Hall, Albyn-Place, Edinburgh.

NOTICE TO CANDIDATES,
AND GENERAL REGULATIONS OF COMPETITION.

When Subjects are specially selected for Competition, it is always to be understood, *1st*, That, however concisely the subjects themselves be announced, ample information is required concerning them; *2d*, That this information shall be founded on experience or observation, and not on simple references and quotations from books; *3d*, That it shall be digested as methodically as possible; and, *4th*, That Drawings, Specimens or Models, shall accompany Writings requiring them for illustration.

Certain conditions are annexed to each of the various subjects of competition, as detailed in the List of Premiums; and these are rigidly enforced by the Society, as the only means of ensuring regularity in the conduct of the business, and of distributing exact justice among the Competitors.

In all Essays for Competition, it is expected that when facts not generally known are stated, they are to be authenticated by proper references. Competitors in Essays shall not communicate their names, but shall transmit along with the Essays a sealed note containing their names and addresses, and inscribed on the back with some distinguishing motto or device, which shall also be inscribed on the Essay. When this regulation is neglected, such Essay shall not be received in competition. If the Essayist has formerly gained a Premium from the Society, for a Paper communicated by him, it is recommended that his subsequent Essay shall be written in a different hand from that of the former successful Paper.

None of the sealed notes, except those which bear the distinguishing motto or device of the Essays found entitled to Premiums, shall be opened; and such as are not found entitled to any premium, shall, with the sealed notes, be returned to the authors, if required. The Society is to be at liberty to publish the Essays, or Extracts from them, for which the Premium, or part of it, shall be awarded.

Candidates are requested to observe, that, in any instance, when Essays, Reports, or Certificates, are unsatisfactory, the Society is not bound to give the reward offered; and that, in certain cases, power is reserved of giving such part only of a Premium as the claim may be adjudged to deserve; but Competitors may feel assured that the Directors will always be inclined to judge liberally of their several claims.

In all Reports of Experiments relating to the Improvement or Management of Land, it is expected that the *expences* shall be accurately detailed.

In the enunciation of all Premiums, having reference to Weight or Measure, the New or Imperial Standards are alone to be understood as referred to; and should Competitors in any instance refer to other Weights or Measures, the exact proportion which these bear to the New Standards must be accurately specified, otherwise the claim will not be entertained.

When Premiums are awarded in Plate, the Society will, in such cases as the Directors may see proper, allow them to be paid in Money, on the application of the successful Candidates.

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Henry Mackenzie, Esq. Heriot Row
John Borthwick, Esq. younger of Crookston
John Swinton, Esq. late of Broad-Meadows
Alex. Campbell, Esq. of Possil
Lieut.-Gen. Graham Stirling of Duchray and Achyle
The Very Rev. George H. Baird, D. D. Principal of the University of Edinburgh
Adam Fergusson, Esq. of Woodhill
* George Macpherson Grant, Esq. of Ballindalloch and Invereshie
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* Robert Clerk Rattray, Esq. younger of Craighall Rattray
* Alex. Pringle, Esq. of Whitebank
* Sir John Hope of Craighall, Bart.
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Robert Dundas, Esq. of Arniston
William Macdonald, Esq. of St Martins

Those marked thus * were elected at the last anniversary meeting.

PREMIUMS, &c.

Highland Society Hall,
Edinburgh, 8th February 1828.

THE HIGHLAND SOCIETY OF SCOTLAND does hereby advertise, That the under-mentioned PREMIUMS are to be given by the Society in the year 1828, &c.

ESSAYS, PLANS, AND REPORTS.

1. PRESENT STATE OF THE HIGHLANDS AND ISLANDS OF SCOTLAND.

A Piece of Plate, of Fifty Sovereigns value, will be given for the best and approved Essay on the State of the Highlands and Islands of Scotland, Agricultural, Manufacturing, and Commercial; the progress and influence of those changes at present affecting their condition, and the means of deriving from these changes, for the benefit of the population at large, the greatest portion of good, and rendering such as have an unfavourable tendency productive of the least possible degree of evil.—Essays to be lodged on or before 20th October 1828.

2. REPORT OF EXPERIMENTS IN DRAINING.

For the best and approved Account of the Drainage of any Farm, or considerable Tract of Land, executed by any person or persons in Scotland, within the period of the last Fifteen years—A Piece of Plate of Fifteen Sovereigns value.

In this report it is expected, that the form and acclivity of the surface, the nature of the soil, and subjacent strata; the means resorted to for detecting the lines of springs, and of removing the obstacles arising from quicksands, and the like, shall be described; and, in a particular manner, that the dimensions of the drains themselves, the kind and quantity of materials employed in filling, the expences of the work, and the other more essential particulars relating to its *execution*, shall be fully detailed; and candidates are farther invited to communicate such opinions as their experience may have led them to form on the general principles and practice of under-draining.

The subject of the essay and report proposed, is the same as that for which a premium was offered and awarded in 1826. But the Society, aware that many individuals, in different parts of Scotland, have executed works of this kind on a great scale, and on approved principles, and desirous of making known, as far as possible, the results of an experience so extended, was induced to renew the offer of a premium, and to afford a longer time than was before allowed for the receiving of communications.—Reports to be lodged by 20th October 1828.

3. PLANS OF FARM BUILDINGS.

1. Twenty Sovereigns, or a Piece of Plate of that value, will be given for the best Design of a range of Farm-Offices, combining economy with utility, for a low country farm, partly employed in rearing and feeding stock, and employing Two Ploughs.

2. Twenty Sovereigns, or a Piece of Plate of that value, will be given for the best Design, on the same conditions, of a range of Farm-Offices, for a farm employing Six Ploughs.

With each of these designs must be produced plans and an elevation of a dwelling-house, suited to the respective classes of farms.

For the first class of farms, there must be the buildings requisite for a thrashing-machine of four horse power; and for the second class, the buildings requisite for a thrashing-machine of six horse power, or for one of corresponding force to be moved by wind, water, or steam.

Candidates are required to communicate, in the form of a short essay or report, their opinions in regard to the choice of situation for such buildings; the form, dimensions, and best arrangement of their several parts, as regards the barns, stables, byres, feeding and shelter sheds, granaries, court-yards, and the like; the defects commonly observable in the construction of this class of buildings; and generally, to offer any suggestions on the subject which their experience and observation may enable them to make. Competitors, if they think fit, may make more than one design for each class of farms, varying the size and arrangements of the buildings, as the farms may be supposed more or less destined for feeding, breeding, the dairy, &c. When designs are given for the two classes of farms, a separate essay or report is not required for each; but one essay or report will be held as sufficient.

Candidates are required to state, in general terms, the expence of such buildings, supposing the materials to be laid down; but they will not be required to furnish minute specifications of the work, unless the designs shall be approved of, in which case, and previous to the final awarding of the premiums, specifications satisfactory to the Society must be furnished.

Competitors will keep in mind, that the object of the Society is to obtain designs of useful plans, really fitted for the purposes of ordinary farms, and that no designs will be considered as fulfilling the objects of this premium, unless they shall be formed with a regard to economy, as well as to the extent and nature of the accommodation to be afforded.

Many country gentlemen must have turned their thoughts particularly to this subject, and it would materially aid the views of the Society, in offering these Premiums, if they would communicate their suggestions to a professional architect, who would profit by them in the plans submitted by him in competition for the Premiums.—The Plans to be lodged on or before 20th October 1828.

4. MAGGOT ATTACKING LIVE SHEEP.

A Piece of Plate, of Fifteen Sovereigns value, will be given for the best and approved Practical Essay on the means of preventing or curing the attack of the Maggot, which has been destructive of Living Sheep, in the West or North-West of Scotland, more especially within the last fifteen years.

Competitors will specify, as minutely as possible, the indications, progress, and consequences of the attack; the exact composition, and mode of applying beneficial remedies, and whether, while preserving the sheep, they injure the wool.

Accurate drawings, or various specimens of the insect, preserved in spirits, both in the stage of a maggot and of a fly, *quite entire*, must accompany the Essay, which is to be lodged on or before 20th October 1828.

5. FISH PONDS.

A Piece of Plate, of Fifteen Sovereigns value, will be given for the best and approved Essay, founded on practical experiment and observation, on the construction and advantages of Fish Ponds in Britain, embracing, 1*st*, An account of their suitable situation, form, dimension, and the like; 2*d*, A detail of the manner of stocking and managing them, with notices of the Fish that do not thrive together, and of the profits derived from Ponds.

Competitors will observe, that the purpose of this Essay is to obtain such information as will enable the Society to determine how far it may be expedient to encourage the formation of Fish Ponds in Scotland.—The Essay to be lodged on or before 20th of October 1828.

6. REARING PIGS, AND CURING BACON.

A Piece of Plate, of Twenty Sovereigns value, will be given for the best and approved Essay, founded on practical experience and observation, on the Breeding, Rearing, and Fattening of Swine, accompanied by a Plan or Model of the most suitable houses or styes, together with the most approved method of Curing Bacon.

It is expected that, in stating facts not generally known, they are to be authenticated by proper references, and any information connected with the subject, which the author can give from his own practice, shall be communicated.—The Essay to be lodged on or before 20th October 1828.

7. THATCHING WITH HEATH AND WITH FERN.

A Piece of Plate, of Ten Sovereigns value, will be given for the best and approved Essay on Thatching with Heath and with Fern or Bracken, from actual experience and observation.

The Society is led to believe that both Heath (*Calluna vulgaris*) and Fern (*Pteris Aquilina*) are very effectual and durable as Thatch, and that, in many situations, particularly in the Highlands, where a great deal of straw, that might otherwise be available as food for stock, is consumed as thatch—heath or fern might be substituted with advantage—and occasionally also for slate, in situations where it is only to be procured with difficulty, and at great expence. The Society is therefore desirous to have a minute and satisfactory account of a proper method of using the heath and the fern respectively, as Thatch—including the most expedient slope or pitch of roof—the durability of the materials, and the expence.—The Essay to be lodged on or before 20th October 1829.

8. THE CONSTRUCTION OF THE PLOUGH.

A Piece of Plate, of Fifty Sovereigns value, will be given for the best and approved Essay on the Construction of the Plough, founded on experiment, and deduced from mathematical principles.

The Essay to be accompanied by Drawings or Models illustrative of the subject; and the writer shall be required to explain the properties and mode of action of the machine, and to describe, in distinct detail, the form, size, and position of its various parts.

To every well formed Plough these properties ought to belong; 1st, it ought to perform the operation intended in a proper manner, and to this end to possess a sufficient degree of strength; 2d, Its parts ought to be so constructed as to be best able to resist the shocks and pressure to which they are subject; and, 3d, They ought to be so combined as to perform the work required with the least resistance. Further, the instrument ought to be no heavier than is consistent with the strength necessary, and as simple in its form as its nature will allow. The power of performing the operation well is the first of these properties to be regarded in the plough, while, in proportion as it possesses the others, may its form be held to be more or less perfect. The Essay to be lodged on or before the 20th October 1829.

9. DISEASE IN TURNIPS.

A Piece of Plate, of Fifteen Sovereigns value, will be given for the best practical Essay or Report on the Disease called "Fingers and Toes;" so destructive of the turnip crop in some of the best turnip districts.

The Essay must be founded upon the personal knowledge of the Author, and is expected to point out a probable preventive for the disease.—To be lodged on or before 20th October 1829.

10. CULTURE OF LUCERNE.

A Piece of Plate, of Ten Sovereigns value, will be given for the best and approved Essay on the necessary culture for raising Lucern (*Medicago sativa*) in Scotland, stating the most suitable soils, as well as others upon which it may be grown with advantage.

The Society having reason to believe that Lucerne, although hitherto grown on a limited scale, and little known in Scotland, may be cultivated with great advantage, in many situations, is desirous of having the best practical information on the subject. It is therefore required that the facts stated, and the mode of cultivation recommended, shall be authenticated by reference to actual experiment. Competitors will also advert to the quantity of produce, the best mode of consuming the crop, its effect as food in fattening stock, and all circumstances and information regarding the properties of the plant, which may be useful for the guidance of those who may cultivate Lucerne.—The Essay to be lodged on or before the 20th October 1829.

11. CONSTRUCTION OF LIME-KILNS.

A Piece of Plate, of Fifteen Sovereigns value, will be given for the best and approved Report, founded on experiment, on the construction of Lime-kilns, comprehending the most recent improvements thereon, and pointing out the means by which the greatest quantity of lime may be obtained with the least consumption of fuel.

It would be satisfactory also that the Essayist should advert to the different varieties of fuel used in burning lime, according to local circumstances.—The Essay to be lodged on or before 20th October 1829.

12. APPLICATION OF LIME.

A Piece of Plate, of Twenty Sovereigns value, will be given for the best and approved Essay, founded on experiment in Scotland, on the most beneficial mode of applying Lime to the different varieties of soil, under various descriptions of culture and crop, both with respect to the quantity as well as to the frequency of the application.

The Essays to be accompanied by an analysis of the lime employed, or a sample of the limestone from which it had been made in the unburned state.—The Essay to be lodged on or before 20th October 1830.

13. STOCKING OF PASTURES.

A Piece of Plate, of Twenty Sovereigns value, will be given for the best and approved Essay, founded upon experience in Scotland, regarding the proportion, species, and description of Live Stock which may be most advantageously pastured together in enclosed grass land.

A principal object to be had in view, is the clean eating of the grass, with a due regard, at the same time, to the fattening and thriving of the different animals, and the periods found best for opening and shutting up such pasture lands. A particular statement will be required of the number, age, or value of the animals when put to grass; the length of time they were severally pastured, and their price or value when removed, with any other information which may tend to elicit the object in view. It is also required that the extent of pasture in each enclosure be specified, with the nature of the soil, surface, length of time in pasture, and mode of management when laid out for grass. It will farther be desirable, in as far as competitors can conveniently ascertain, to know the particular grasses that constitute the pasture, and any thing remarkable in regard to the destruction of weeds, should any such have been found troublesome. —The Essay to be lodged by 20th October 1830.

CONDITIONS OF COMPETITION.

The conditions of Competition for Essays and Reports will be found under the "General Notice to Candidates," prefixed to the List of Premiums, and to which Competitors are referred.

The Essays and Reports on Subjects 1, 2, 3, 4, 5, and 6, are to be lodged at the Society's Hall, on or before the 20th of October next 1828. Those on Subjects 7, 8, 9, 10, and 11, by 20th October 1829; and the Essays on Subjects 12 and 13, by 20th October 1830. In regard to some of the Subjects for Essays, formerly advertised, the period of lodging the papers having been intimated to be the 10th of November, instead of the 20th of October, now fixed, they will of course be received, if duly lodged by the day originally named.

EXPERIMENTS AND IMPROVEMENTS.

CLASS I.

PREMIUMS FOR STRAW PLAIT MANUFACTURE.

1. RAISING STRAW FOR THE MANUFACTURE.

1. For the best specimens in a bleached state, of *Rye* Straw, raised in Scotland, for the purpose of being manufactured into Imitation Leghorn Bonnets—Ten Sovereigns.

For the next best specimen of the same—Five Sovereigns.

2. For the best specimen, in a bleached state, of Straw actually raised in Scotland, from the *Grano marzolano*, or kind of wheat cultivated in Tuscany for this purpose; or any other species of wheat affording a culm of equal fineness, pliancy and toughness—Ten Sovereigns.

CONDITIONS.

The specimens to be put up in bundles of not less than two inches diameter; and to be lodged at the Society's Hall on or before the 10th December 1829, with a narrative of the circumstances of their growth and preservation, and certificates satisfactorily signed, of the facts therein detailed. It is expected that the specimens produced by each competitor shall have been selected from a crop grown to the extent of at least half an acre.

Intending Competitors will receive a copy of a memorandum containing some interesting information which has been communicated to the Society, on certain points of management in the growth and preparation of the Straw used in the Tuscan trade, upon calling at the Society's Chambers.

2. PREMIUMS TO ACTUAL WORKERS OF STRAW PLAIT.

1. For the best specimen of a Bonnet made from Straw grown in Scotland, and in imitation of Leghorn plait, wholly manufactured for sale by any individual in Scotland, except in the Orkney Islands—Five Sovereigns.

For the second best specimen—Three Sovereigns.

2. For the best specimen of a Bonnet made from Straw grown in Scotland, and in imitation of Leghorn Plait, wholly manufactured by any individual in the Orkney Islands, and intended for sale —Five Sovereigns.

The Competing Bonnets, and specimens of the Straw from which they are made, to be lodged at the Society's Hall on or before the 10th of December next, along with a statement specifying the kind of straw,—by whom raised,—the price or value thereof, and of the

Bonnet,—the time occupied in knitting and plaiting it, that the specimen sent is the work of the Competitor; and such circumstances regarding the preparation and the process of manufacture in its different stages as the party may be enabled to furnish; the statement to be accompanied by the affidavit of the Competitor in support of the circumstances therein detailed.

CLASS II.

WASTE LANDS.

1. HONORARY PREMIUM FOR IMPROVEMENT OF LAND FOR TILLAGE.

To the Proprietor or Tenant in Scotland, who shall, on or before the 10th of December in any year, transmit to the Society a satisfactory report, of his having, within the period of five years immediately preceding the date of his communication, successfully improved and brought into tillage, an extent of waste and hitherto uncultivated Land, not being less than thirty acres—The Gold Medal.

The Report may comprehend such general observations on the improvement of Waste Land as the writer's experience may have led him to make; but is required to refer especially to the particular tract reclaimed, to the nature of the soil, the previous state of the ground, the obstacles opposed to its improvement, the mode of management adopted, the expence, and, in as far as can be ascertained, the produce and value of the subsequent crops; and the land must have borne one crop of grain at least, previous to the year in which the Report is made. The Report must be accompanied by a certified measurement of the ground.

2. DRAINING MOSS AND BOG LAND.

First District—*The Parishes of Huntly, Cabrach, and Auchindoir, in the County of Aberdeen; and Botriphney, Keith, Cairney, Grange, Boharm, Mortlach, Inveravon, and Kirkmichael, in the County of Banff.*

Second District—*The Upper Ward of Lanarkshire.*

To the Person, in the First District, who shall, between 1st March 1826, and 1st October 1828, have executed in an effectual manner, the greatest extent, not less than 3000 yards, of Drain, in Moss or Bog Lands, and with a view to the amelioration of the climate, as well as to the improvement of the soil—A Piece of Plate of Twenty Sovereigns value.

For the next greatest extent as aforesaid, not less than 1800 yards—A Piece of Plate of Ten Sovereigns value.

To the Person in the Second District, who shall, between 1st March 1827 and 1st October 1829, have executed the greatest extent, not less than 6000 yards, as aforesaid—A Piece of Plate of Twenty Sovereigns value.

For the next greatest extent, in the Second District, as aforesaid, not less than 3000 yards—A Piece of Plate of Ten Sovereigns value.

Competitors will observe, that these Premiums being offered chiefly with a view to the amelioration of the climate, the Society understands them to apply, not to hill and pasture grounds, which may be improved by surface or sheep drains, but to those tracts of flow moss and bog lands, usually situated at a lower level, and frequently with nearly a flat surface; and that, to entitle a proprietor to either of the premiums, in preference to a tenant, he must have drained double the extent of the tenant.

In the First District, the extent of surface drained must not be under twenty acres for the first, and ten acres for the second premium, and, in the Second District, not under forty acres for the first, and twenty acres for the second premium. It is required that the ground so drained shall be effectually cleared of stagnant water and superabundant moisture; and, in as far as circumstances will admit, rendered fit for planting, raising grain, or producing useful herbage for the pasturing of cattle and sheep.

Certificates in favour of Competitors, specifying the above particulars, to be subscribed by two Members of the Society, who shall have seen the state of the ground previous to, and at the conclusion of the operations, accompanied with a particular account, verified by affidavit, respecting the extent and description of the drains executed, their general depth and width; the state of the ground previous to, at different stages, and conclusion of the operations; the mode in which the same were executed; the expence; with any other circumstances connected with the subject, of which it may appear material that the Society should be informed. Certificates for the First District must be transmitted to the Secretary on or before the 10th November 1828; and, for the Second District, on or before the 10th November 1829.

3. FORMING MEADOWS FROM MOSS BY IRRIGATION CHIEFLY.

To the Tenant in Scotland, who shall have succeeded best in creating a productive Meadow from Peat Moss, not being less than Five Acres, and regularly affording crops of Hay, by Irrigation chiefly—Ten Sovereigns.

The process pursued, and the nature, quality, and amount of the produce, to be specifically detailed and confirmed by the affidavit of the

Reporter, and the certificates of at least two Members of the Society belonging to the neighbourhood—Reports to be transmitted to the Secretary by the 10th November 1829.

4. FORMING MEADOWS FROM MOSS BY OTHER MEANS.

To the Tenant of lands who shall have succeeded best in creating a productive Meadow from Peat Moss, by *other means than Irrigation*, not being less than Six Acres—Ten Sovereigns.

The mode of improvement, nature and quality, and amount of produce, and the easiest mode of saving the seeds for the formation of a similar meadow, to be all detailed in a Report, and the facts authenticated by the affidavit of the Reporter, and certificates of two Members of the Society in the vicinity.—Reports to be transmitted to the Secretary by 10th November 1829.

CLASS III.

CROPS AND CULTURE.

1. RAISING GREEN CROPS IN THE FOLLOWING DISTRICTS, viz.

1. *The District of Strathspey, in Inverness-shire and Morayshire.*
2. *The Island of Bute.*

To the actual farmer, being a tenant in each of the said two districts, renting lands not exceeding L. 15 yearly, who shall have had the greatest extent, not less than One Acre of his arable land sown down with a crop of Red Clover and Rye Grass in 1827, (the field having been under a crop of Turnips properly manured, and three times hoed in the preceding year), and the Grass so laid down being made into Hay in 1828, for the first year's cutting—Three Sovereigns.

To the actual farmer, being a tenant in each of the said districts, renting lands above L. 15 and under L. 40 yearly, who shall have had the greatest extent, not less than Three acres, of his arable land, treated and sown down as aforesaid, and the crop made into Hay in 1828, for the first year's cutting—Five Sovereigns.

To the actual farmer, being a tenant in each of the said districts, renting lands from L. 40 to L. 100, who shall have had the greatest extent, not less than five acres, treated and sown down as aforesaid, and the crop made into Hay in 1828, for the first year's cutting—Seven Sovereigns.

To the actual farmer, being a tenant in each of the said districts, renting lands above L. 100, who shall have had the greatest extent, not less than Seven acres, treated and sown down as aforesaid, and the crop made into Hay in 1828 for the first year's cutting—Ten Sovereigns.

Certificates for these Premiums are to be subscribed by two Members of the Society, or by one Member, along with a Justice of the Peace, and must specify all particulars above noticed, with any other circumstances relative to the mode of cultivation which may appear material. It is required that they shall also specify the amount of rent paid by the tenant; and in the event of the whole, or a part thereof, being payable in grain, it is to be converted into money at the fiar prices of the counties for the preceding year. The certificates must farther state, that the land, when under turnips, had been properly manured for that crop; and give the opinion or estimate of the Reporters of the probable produce of hay per acre; and it is expected that the land shall have been limed. By "actual farmer" is meant a person who makes his livelihood principally by farming as a stated and ordinary occupation. Certificates for the two Districts to be transmitted to the Secretary by the 10th December 1828.

2. FEEDING OFF TURNIPS BY SHEEP.

The Society being of opinion that the practice which obtains in some districts in England, and of the south of Scotland, of feeding off Turnips on the ground by Sheep, may be advantageously introduced into other districts, and in certain soils and situations, offers the following premiums, in the districts after mentioned, viz.

1. *The Shires of Nairn, Moray, and Lower District of Banff adjoining.*
2. *Wigtonshire.*
3. *The Moulinearn, Dunkeld, and Blairgowrie Districts of Perthshire.*
4. *The District of Aberdeenshire and Kincardineshire, on both sides of the River Dee, comprehending the Parishes of Nigg, Banchory-Devenich, Maryculter, Peterculter, Durris, Drumoak, Upper Banchory, Strachan, Kincardine O'Neil, Lumphanan and Aboyne.*

To the farmer in each of the first and second districts, who, in the year 1827, shall have cultivated the greatest extent of turnips, in proportion to the size of his farm (not being under Ten acres), and of which at least one half shall be eat off on the ground by the feeding of sheep, carefully and regularly inclosed with hurdles, and upon land well adapted for the purpose—Ten Sovereigns

To the farmer in each of said districts, who shall have cultivated and fed off the next greatest extent as aforesaid—Five Sovereigns.

To the farmer in the third district *south* of the road leading from Dunkeld to the bridge of Ruthven, passing Forneth and Blairgowrie, who shall, in the year 1828, cultivate the greatest extent of turnips, in proportion to the size of his farm (not being less than ten acres), and of which at least one half shall be eat off on the ground, in manner aforesaid—Ten Sovereigns.

To the farmer *north* of the same road, who shall cultivate and feed off the greatest extent of turnips, in proportion to the size of his farm, not being less than four acres—Five Sovereigns.

To the farmer in the fourth district, who shall, in the year 1828, cultivate the greatest extent of turnips, in proportion to the size of his farm, not being less than ten acres, and of which at least one-half shall be eat off on the ground in manner aforesaid—Ten Sovereigns.

To the farmer in the fourth district, who shall cultivate and feed off the next greatest extent, not less than four acres.—Five Sovereigns.

Should a portion only of the field be reserved to be fed off by sheep, in this case the blanks left by the turnips removed shall not exceed five drills, so as the benefit of this mode of feeding arising from the treading and manure of the stock so fed, may be distributed over the whole field.

Competitors for crop 1827 will transmit to the Secretary of the Society, on or before 10th November 1828, an affidavit, specifying the extent of ground under turnips, the kind or kinds raised, the proportion fed off by sheep, and within what period; description of sheep so fed, and whether they were the claimant's own stock, or were sent for feeding by another, and, in the last case, the price obtained per acre will be stated; the affidavit to be accompanied by the certificate of two Members of this Society, in support of the matters therein detailed.

The like certificates, as referable to crop 1828, to be transmitted by 10th November 1829.

3. SOILING SHEEP.

A Gold Medal, or Piece of Plate, of Ten Sovereigns value, will be given for the best and approved Report of an experiment for ascertaining the relative advantages between the systems of soiling and grazing sheep.

The Reports will specify the number and description of the sheep selected for the experiment, and are to be lodged on or before 10th November 1830.

4. CULTIVATION OF FIELD BEET OR MANGEL WORZEL.

A Gold Medal or Piece of Plate, of Ten Sovereigns value, will be given for the best and approved account of an experiment, or series of experiments, on the cultivation of Mangel Worzel, and on its application to the purposes of feeding Dairy-Cows or other Live Stock.

In this experiment, the nature of the soil, and the kind and quality of manures employed, must be stated, and the period of sowing and general cultivation of the crop distinctly detailed. The extent reported to be cultivated in any single experiment must not be less than two acres standard measure, but for ascertaining the weight of produce it will be sufficient to weigh the roots of half an acre. The mode of storing, and the application of the produce to the feeding of Stock, must be described, and the results fully stated; and it being important to ascertain the value of the plant, as compared with turnip, it would be desirable that those making the experiment should institute a comparison, as far as circumstances will allow, between the expences and difficulties of cultivation of the two kinds of crop, and the weight, value, and uses of their respective produce. It will be important, too, to give attention to the plant, in as far as regards its liability to disease; and Candidates generally are invited to communicate their opinions, founded on the experience they have acquired, as to how far this plant seems suited to the climate and soil of Scotland; and in what respects and cases it may be used beneficially as a substitute for the root plants now in use. Reports to be lodged by 10th November 1829.

5. BONE MANURE.

1. To the person in Scotland, *south of the Forth*, who shall in the year 1828, raise the greatest breadth, and greatest average weight per acre, of Turnips, by means of bone manure alone, not less than twenty acres—Twenty Sovereigns, or a Piece of Plate of that value.

For the second greatest extent and weight, not under ten acres —Ten Sovereigns, or Plate of that value.

2. To the person in Scotland, *north of the Forth*, who shall raise the greatest extent and weight of Turnips, as aforesaid, not under ten acres—Ten Sovereigns, or a Piece of Plate of that value.

For the second greatest extent, north of the Forth, not under five acres—Five Sovereigns, or Plate of that value.

A specific Report is required of the expence and of the manner of applying the Bones, in regard to size, mode of sowing, and other particulars, also the nature of the soil, culture and treatment of the field, for the three preceding seasons, especially as regards any calcareous manure having been applied. The crop must be viewed some time in the month of October or November next, by two or more Members of the Society, and a fair sample weighed in their presence, to enable them to certify the average weight per acre, without tops,—the certificate to be accompanied by the affidavit of the competitor or his overseer, in regard to the quantity of bone manure applied.—Certificates to be lodged on or before the 10th November 1829.

6. PLOUGHING COMPETITIONS.

The Highland Society, finding that Premiums to Ploughmen for improvement in ploughing, have for some years been given very generally over the country by the resident gentlemen and Local Agricultural Societies, has, in the mean time, discontinued them; but being desirous of encouraging improvement in this branch of husbandry, the Society will give its Silver Medal to the Ploughman found to be the best at such competitions, provided not fewer than twelve Ploughs shall have started. The Medal will be issued upon a Report from one or more Members of the Society, who shall have actually attended the competition, stating the number of Ploughs that had started, and that the Ploughman found to be the best had not received the Society's Medal at a previous competition in the same district.

CLASS IV.

PASTURES.

1. LAYING DOWN LANDS TO PERMANENT PASTURE.

To the Proprietor or Tenant in Scotland who shall report the most successful experiment in laying down a field to permanent pasture, not being less than five statute acres, and which shall afford the best combination of the finer grasses, for giving a renewed succession of plants, in proportion to the advance of the season—Twenty Sovereigns, or a Piece of Plate of that value.

In offering this premium, the Society has in view an object hitherto little attended to in Scotland, viz. the cultivation of some of the most valuable natural grasses for pasture grounds; and its object is, in the first instance, to have decisive experiments as to the different kinds which are best adapted to a variety of soils, and to the climate of this country. There is no doubt that the ordinary mode of raising Rye Grass and White Clover alone, in every kind of soil, must in many cases be highly erroneous; and even considering them as a temporary introduction, and merely as substitutes to occupy the ground till the natural grasses spontaneously come into the pasture, much time is lost, and probably a greater sacrifice incurred, than if a judicious selection at once had been made of the seeds which are most congenial to the soil and situation. The Society is unwilling to limit the number of the grasses on which these experiments ought to be tried, though it would wish them to be made on those chiefly which are generally acknowledged as the most valuable; and it recommends to the notice and guidance of those who turn their attention to this purpose, the short tracts on the subject of grasses by *Stillingfleet* and *Curtis*; the later and more extensive work by *Mr Sinclair*, the "Hortus Gramineus Woburnensis," of which a new edition has lately been published; and the papers by the *Rev. Dr Singer*, and the late *Mr Don*, published in Vol. III. of the Society's Transactions, pp. 129 to 223.—Reports to be transmitted by 10th November 1829.

2. COMPARATIVE ADVANTAGES OF LAYING DOWN LANDS TO PASTURE WITH AND WITHOUT A WHITE CROP.

There being reason to believe that the sacrifice of a white crop in laying down lands to pasture, will, in many instances, be counterbalanced by the superior produce of grass, the Society is induced to offer the following Premium:

A Piece of Plate, of Twenty Sovereigns value, will be given for the best and approved comparative Report, founded upon actual experience in Scotland, of Land laid down to Pasture with the Native Indigenous Grasses, adapted to the particular soil, *without any white crop*, along with the Grass Seeds; and of Land in similar circumstances of soil, climate, and condition, sown down with the same grasses, *along with a white crop*.

The extent of land in each experiment, not to be less than seven acres; and a particular statement is required of the kinds and quantities of the grass seeds used, with a distinct account of the kind and number of stock pastured upon each field, with their comparative progress in condition, for three successive seasons. The sort of grain sown as white crop must be likewise reported. A hay crop is of course excluded.—Reports to be lodged by the 10th November 1832.

3. EXPERIMENTS WITH FRESH AND ROTTED DUNG.

A Piece of Plate, of Twenty Sovereigns value, will be given for the best and approved Report, founded on actual experiment on the comparative effects of Fresh Dung and Rotted Dung (arising from the same species of animal and forage) upon pasture, within the same year.

The extent of ground devoted to the experiment not to be less than one acre for each kind of dung, to be made on the same field, and as much as possible on the same quality of soil; two experiments to be reported by each Competitor, and upon different pieces of ground. Dung not to be considered as fresh after a month.—Reports to be lodged on or before the 10th November 1828.

4. LAYING DOWN THE POORER SOILS TO GRASS.

To the Tenant in Scotland who shall report the best practical experiment *in laying down the Poorer Soils to Grass*, and continuing them for some time in pasture, keeping in view the chance or necessity of breaking them up again for cultivation, when other soils might, in a similar way, require an occasional period of rest—Ten Sovereigns.

The process pursued, the expence incurred, and the nature and amount of the produce, to be specifically detailed and confirmed by the affidavit of the Reporter, and the certificate of at least two Members of the Society belonging to the vicinity. Reports to be transmitted to the Society by 10th November 1829.

5. TURNING UNCULTIVATED MOOR LAND TO PASTURE.

To the Tenant of Lands who shall have succeeded best in turning an Uncultivated Moor into a productive pasture, by Lime or other means, not being less than ten acres.—Ten Sovereigns.

For the second best improvement of this kind—Five Sovereigns.

The mode of improvement, the time, expence, produce, and other details, to be specifically reported, on the affidavit of the Reporter, and authenticated by at least two Members of the Society belonging to the neighbourhood.—Reports to be transmitted by 10th November 1829.

6. SAVING THE SEEDS OF NATURAL GRASSES.

To the Seedsman, or other person, who shall report to the Society the most successful experiments in raising, in Scotland, for sale, the seeds of all, or any, of the following Natural Grasses, with the view of supplying the demand in laying down grounds in the best way to permanent pasture, viz.

Anthoxanthum odoratum, or sweet-scented vernal grass.
Alopecurus pratensis, or meadow fox-tail grass.
Poa trivialis, or rough-stalked meadow-grass.
Festuca duriuscula, or hard fescue-grass.
Cynosurus cristatus, or crested dog's-tail grass.
Dactylis glomerata, or cock's-foot grass.

—Ten Sovereigns, or a Piece of Plate of that value.

The whole ground devoted to the purpose, in one season, not to be less than one acre; and the experiment to be made on not fewer than three of these kinds of grasses; and it is strongly recommended, that the seed shall be saved from crops which have been separately sown in drill, and kept clean by hoeings, from all mixtures of other grasses and weeds.—Reports, confirmed by affidavit, and specifying the details of the experiments, the mode of raising the seed adopted, with the kinds and quantities produced and disposed of, and accompanied by specimens of the seed, to be transmitted to the Society by 10th November 1829.

CLASS V.

LIVE STOCK.

I. BLACK CATTLE—BREEDING STOCK.

PREMIUMS FOR IMPROVING THE BREED OF BLACK CATTLE IN THE FOLLOWING DISTRICTS.

1. *The District of Nithsdale, Dumfries-shire.*
2. *The Stewartry of Kirkcudbright.*
3. *Wigtonshire.*
4. *The Island of Arran.*
5. *The Districts of Mid and Nether Lorne, in the County of Argyll, comprehending the parishes of Ardchattan and Muckairn; that part of the parishes of Inishail and Kilchrenan lying north of Loch-awe; the parishes of Kilmore and Kilbride; the parish of Kilninver; that part of the parish of Kilmelfort lying within the District of Lorne; and the parishes of Kilbrandon and Kilchattan.*
6. *Clackmannanshire, including the parishes of Culross, Fossaway, Tulliallan, Muckhart, and Glendevon, in the county of Perth, and Alva in Stirlingshire.*
7. *The following parishes in the counties of Stirling, Dumbarton, and Perth, viz. Drymen, Buchanan, Balfron, Gargunnock, Cardross, St Ninian's, Kippen, Gargunnock, Baldernock, Killearn, Strathblane, Fintry, Kilmaronock, East and West Kilpatrick, Bonhill, Dumbarton, Cardross, Aberfoyle, and Port.*
8. *The District of Kincardineshire, comprehending the parishes of Fettercairn, Fordoun, Marykirk, Garvock, Laurencekirk, Arbuthnott, Glenbervie, and that part of the parish of Edzell in Kincardineshire.*
9. *The District of Aberdeenshire, comprehending the parishes of Strathdon, Glenbucket, Cabrach, Towie, Tarland and Migvie, Logie Coldstone; those parts of the parishes of Coul and*

Tulloch, in Cromar; those parts of the parishes of Glenmuick, Glengarden, and Tullich, and of Crathie, which are on Garden-side and in Morven.

10. *The District of Buchan, in Aberdeenshire, from the river Ythan, on the south, to the river Doveran, on the north and west, including also the adjoining parishes of Logie Buchan, Foveran, and Methlick, in the District of Fomartin.*
11. *The eastern District of Forfarshire, comprehending the particular parishes specified in the advertisement of last year.*
12. *The Districts of Morvern, Ardnamurchan, Sunart, and Kingerloch, in the county of Argyll.*
13. *The Districts of Moidart, Arisaig, and Knoidart, including the islands of Eig, Rum, and Canna, in the counties of Inverness and Argyll.*
14. *The Islands of Shetland.*

For the best Bull, from two to seven years old, *bona fide* the property, and in possession of any proprietor or tenant in *each* of the nine Districts, Nos. 1, 2, 3, 6, 7, 8, 9, 10 and 11, as above described, kept on his farm within the District, from the 20th day of May preceding the day of competition—Ten Sovereigns.

For the second best Bull, of the age above specified, *bona fide* the property, and in possession of any proprietor or tenant in *each* of the said Districts, and kept on his farm within the District, for the aforesaid period—Five Sovereigns.

For the best Bull, of the age above specified, *bona fide* the property, and in possession, of any tenant in *each* of the five Districts, Nos. 4, 5, 12, 13, and 14, kept on his farm within the District from the 20th day of May preceding the competition—Ten Sovereigns.

For the second best Bull, of the same age, in *each* of the said five last mentioned Districts, the property, and in possession of any tenant, and kept on his farm within the District for the foresaid period—Five Sovereigns.

For the best *two* Queys, of two years old, the property of and bred by any tenant in each of the *fourteen* Districts above mentioned—Five Sovereigns.

For the second best *two* Queys, of two years old, the property of and bred by any tenant in each of the *fourteen* Districts above mentioned—Three Sovereigns.

The premiums in the 1st, 2d, and 3d Districts are limited to the Galloway polled breed of cattle; and in the 4th, 5th, 12th, and 13th, to the West Highland breed. The competition in the Districts Nos. 1 to 10, both inclusive, will take place in 1828. In

Nos. 11 to 14, both inclusive, the first competition under the system of alternate years having been held in 1827, the next competition will take place in 1829. In the intermediate year, such premiums only as shall be given by the gentlemen of the respective Districts, or by local associations therein, are to be competed for.

The following Members of the Society (as Members only, or their Factors in their absence, can be named) are hereby appointed Judges for the Ten Districts first above mentioned.—In the four last Districts the Judges were named in the advertisement of last year

For the First District.—C. G. S. Menteath, Esq. of Closeburn; R. C. Ferguson, Esq. of Craigdarroch, M. P.; Henry Veitch, Esq. of Elliok; Peter Johnston, Esq. of Cairnsalloch; James Grierson, Esq. of Dalgoner; Patrick Millar, Esq.; Captain Alexander Gordon, R. N.; G. Whigham, Esq. of Hallidayhill; J. Macalpine Leny, Esq. of Dalswinton; Gilbert Young, Esq. of Youngfield; Thomas Crighton, Esq. William Fraser, Esq. of Glenmaid; Robert Macturk, Esq. younger of Stenhouse; James Seton Wightman, Esq. of Courance; Robert Whigham, Esq. of Lochpatrick; and any other members in the District; four a quorum.—Mr Steuart Menteath, Convener.

For the Second District.—The Earl of Galloway; Sir John Gordon of Earlston, Baronet; Sir David Maxwell of Cardoness, Baronet; Sir Alexander Gordon; R. Abercromby, Esq. of Birkenbog and Forglen; Edward Boyd, Esq. of Mertonhall; Thomas Corrie, Esq. of Culloch; D. H. Craik, Esq. of Arbigland; Lieutenant-General James Dunlop of Dunlop; Robert Cutlar Fergusson, Esq. of Craigdarroch, M. P.; James Gordon, Esq. of Culvennan; William Young Herries, Esq. of Spottes; W. B. K. Laurie, Esq. of Woodhall; Andrew Macdouall, Esq. of Logan; Lieutenant-Colonel Maxwell of Orchardtoun and Gretnay; Adam Maitland, Esq. of Dundrennan; William Maitland, Esq. of Auchlane; Alexander Murray, Esq. of Broughton; John Napier, Esq. of Mollance; R. A. Oswald, Esq. of Auchincruive; and any other members in the District; five a quorum.—Colonel Gordon of Culvennan, Convener.

For the Third District.—The Earl of Galloway; Sir William Maxwell, Baronet, M. P.; Sir James Dalrymple Hay, Baronet; Sir David Maxwell, Baronet; James Blair, Esq. of Penningham, M. P.; Forbes Hunter Blair, Esq. of Dunskey; Nicol Brown, Esq. of Waterhaughs; John Cathcart, Esq. of Genoch; Hugh Hathorn, Esq. of Castlewig; Vans Hathorn, Esq. of Garthland; Colonel Macdouall of Logan; Lieutenant-Colonel Macdouall, Stranraer; Stair Stewart, Esq. of Physgill; and any other members in the District; five a quorum.—Mr Cathcart of Genoch, Convener.

For the Fourth District.—The Duke of Hamilton; Captain Fullarton of Kilmichael; Robert Brown, Esq.; John Paterson, Esq.; and any other members in the District; two a quorum.—The Duke of Hamilton, in his absence his Grace's factor, Convener.

For the Fifth District.—The Earl of Breadalbane; Viscount Glenorchy; Lord John Campbell; General Campbell of Lochnell; General Campbell of Monzie; Duncan Campbell, Esq. of Barcaldine; Robert Campbell, Esq. of Ardchattan; Charles Campbell, Esq. of Combie; Alexander Campbell, Esq. of Brackley; Donald Campbell, Esq. younger of Dunstaffnage; Colin Campbell, Esq. of Balliveolan; Captain Macdougall of Macdougall, R. N.; and Dugald Macdougall, Esq. of Gallinich; and any other members in the District; five a quorum.—Lochnell, in his absence Mr Macdougall of Gallinich, Convener.

For the Sixth District.—Lord Abercromby; Count Flahault; Sir Gilbert Stirling, Baronet; Robert Clark, Esq. of Comrie; James Erskine, Esq. of Aberdona; Thomas Graham Stirling, Esq. of Airth; J. R. Johnston, Esq. of Alva; Craufurd Tait, Esq. of Harviestoun; Alexander Macfarlane, Esq. of Thornhill; and John Mowbray, Esq. of Cambus; and any other members in the District; three a quorum.—Lord Abercrombie, in his absence Mr Johnston of Alva, Convener.

For the Seventh District.—The Duke of Montrose; the Marquis of Graham; Sir Archibald Campbell, Bart.; H. Macdonald Buchanan, Esq. of Drummakill; R. C. Bontine, Esq. of Ardoch; John Cross Buchanan, Esq. of Auchintoshan; John Buchanan, Esq. of Carbeath; John Buchanan, Esq. of Ardoch; John Buchanan, Esq. younger of Ardoch; Archibald Buchanan, Esq. of Auchintorlie; P. Buchanan, Esq. of Auchmar; John Campbell, Esq. M. P.; J. C. Colquhoun, Esq. of Killermont; Samuel Cooper, Esq. of Ballindalloch; James Dennistoun, Esq. of Colgrain; J. Dennistoun, Esq. younger of Colgrain; J. M. Gartshore, Esq. of Gartshore; W. Dunn, Esq. of Kilbowie; W. C. C. Graham, Esq. of Gartmore; John Graham, Esq. younger of Ballagan; Peter Speirs, Esq. of Culcruich; General Graham Stirling, of Duchray; J. R. Smollet, Esq. of Bonhill; R. Macgown, Esq. of Mains; John Macadam, Esq. of Blairover; and any other Members in the District; five a quorum—the Duke of Montrose, in his absence Mr Macdonald Buchanan, Convener.

For the Eighth District—The Earl of Kintore, Viscount Arbuthnot, Colonel the Hon. H. Arbuthnot, M. P.; Thomas Burnett, Esq. younger of Leys; R. Barclay Allardice, Esq. of Ury; General Burnett of Banchory Lodge; Alexander Crombie, Esq. of Phesdo; R. W. Duff, Esq. of Fetteresso; R. Duff, Esq. younger of ditto; George Douglass, Esq. Sheriff-depute of the county; John Burnett, Esq. of Kemnay; Sir Alexander Keith, K. M.; George Robertson Scott, Esq. of Benholm; James Scott, Esq. of Brotherston; Major-General Straton of Kirkside

William Shand, Esq. of Arnhall; William Stewart, Esq. Sheriff-clerk of the county; and any other members in the district; three a quorum—Lord Arbuthnot, in his absence, Captain Ramsay, Convener.

For the Ninth District—The Duke of Gordon, the Earl of Aboyne, the Earl of Fife; Sir Charles Forbes, Bart. M. P.; John Forbes, Esq. M. P.; Major-General Forbes of Auchernach; Major Anderson of Candycraig; William Farquharson, Esq. of Monaltrie; Archibald Farquharson, Esq. of Finzean; the Rev. Dr Forbes of Blelack; Major Forbes of Inverernan; Charles Gordon, Esq. of Wardhouse; J. D. Gordon, Esq. younger of ditto; Alexander Leith, Esq. of Freefield; Henry Leith Lumsden, Esq. of Auchindoir; Charles Forbes, Esq. of Asloun; Benjamin Lumsden, Esq. of Kingsford; and John Roy, Esq. factor on the estate of Invercauld · and any other members in the district; four a quorum—John Forbes, Esq. M. P., in his absence, Dr Forbes of Blelack, Convener.

For the Tenth District—The Earl of Aberdeen, Lord Saltoun, Sir William Forbes, Bart.; Sir Charles Forbes, Bart., M. P.; John Forbes, Esq. M. P.; Michie Forbes, Esq. of Crimond; Colonel Gordon of Cluny, M. P.; T. A. Fraser, Esq. of Lovat and Strichen; Garden Duff, Esq. of Hatton; James Ferguson, Esq. of Kinmundy; John Gordon, Esq. of Cairnbulg; Thomas Gordon, Esq. of Buthlaw; James Hay, Esq. of Monkshill; Alexander Forbes Irvine, Esq. of Chivas; J. W. Mackenzie, Esq. of Pitrichie; John Turner, Esq. of Turnerhall; William Urquhart, Esq. of Byth; and any other members in the district; five a quorum—Lord Saltoun, in his absence, Mr Ferguson of Kinmundy, Convener.

For the Eleventh, Twelfth, Thirteenth, and Fourteenth Districts, the Judges and Conveners remain as intimated last year, with the addition of those resident Members who have been since elected.

RULES OF COMPETITION.

1. The Conveners, with the approbation of a quorum of the Judges for conducting the several competitions, are respectively authorised, in such cases as they shall see proper, to divide the two premiums allowed for bulls into three premiums, in such proportions as they shall approve, the first premium for bulls not being less than Eight Sovereigns; and, in like manner, to divide the sums allowed for queys into three premiums, fixing their amount.

2. The Judges shall not place for competition any stock which, in their opinion, does not fall within the regulations prescribed, or does not possess merit; and, in no instance shall any of the premiums be awarded where there are not, after such selection, at least three competitors; reserving to the Judges, in the case here provided for, to make such allowance to a party shewing stock of merit, not exceeding half the amount of the premium, as under the circumstances they may think reasonable.

3. The times, and also the places of competition, with the exception after-mentioned, are to be fixed by the Conveners, with the advice of at least a quorum of

their respective Committees; and the competitions are to take place between the 20th day of July and the 1st day of November.

4. It is required that the Convener of each Committee shall give timely notice to the other Judges of the District, of the place and time of competition; and shall be particularly careful that the same be intimated at the several parish church-doors within the district, for *at least* two successive Sundays previous to the competition.

5. As these premiums were given in several of the above-mentioned districts in 1827, and some of them also in 1826, it is to be observed, that the Society does not admit an animal in any class of stock which may have gained a *first* Premium in a former year, to be again shewn *in competition* in any district; and for no description of stock shall either the same or a lower denomination of Premium be awarded in the district in which they have already gained such Premium.

6. No Member of the Committee shewing Stock of his own at the competition, shall act as a Judge, nor shall Factors, when they are Members of the Society, and are named Judges, or when acting as such in the absence of proprietors, compete for premiums in the district in which they are Judges, in those districts and classes in which proprietors are excluded from competition. In all cases, it is expected that the Bulls for which premiums are awarded, shall not be limited to serve the stock of the owner. The same person not to obtain more than one of the premiums for bulls, nor more than one of the premiums for queys, in one year.

7. In order to entitle the competitors to their respective premiums, a regular report, signed by the Convener, and at least a majority of the Judges who attend the competition, must be transmitted by the Convener, so as to be received by the Secretary on or before the 10th of December next after the day of competition; and which report must specify the ages of the Bulls and Queys preferred: the length of time the Bulls have been in the possession of the competitors; and, with respect to the Queys, that they were bred by the competitors, and were their property on the day of competition; the number of Bulls and Queys respectively produced thereat; the number placed for competition; the names and designations of the persons to whom the premiums have been adjudged; amount of premiums voted to each; and, in general, that all the rules of competition fixed by the Society, as above-mentioned, have been strictly observed; and, in particular, that the previous intimations to the Judges, and advertisements at church doors, were regularly made, as required. In case all the Judges, who may have attended, shall not have subscribed the report, the Convener will mention the cause which may have prevented their doing so.

Farther, it is to be distinctly understood, that in no instance does any claim lie against the Society for expences attending a show of stock, beyond the amount of the premiums offered.

With reference to the competition in the 1st, 2d, and 3d Districts, the Reports must specify that the Bulls and Queys preferred were of the Galloway breed, and in the 4th, 5th, 12th, and 13th Districts of the West Highland breed.

Conveners are requested to get the Reports drawn up and signed by a majority of the Judges present at the competition before they separate. Alloa is fixed as the place of competition for the 6th District, Fettercairn for the 8th, the New Arms Inn, Strathdon, for the 9th, and Old Deer for the 10th District.

NOTE.—The Society being impressed with the benefit to be derived from continuing these competitions in the same districts for a longer period than had formerly been the practice, proposes to offer them in Districts 3d to 10th, both inclusive, (in which the present is the first year's competition of the series), for the years 1830 and 1832; and provided the gentlemen of the districts, or any local association therein, shall continue the competitions, and award premiums in any of these eight districts to the amount of not less than one-half of the Society's premiums, and to the same description of stock during the intermediate years 1829 and 1831, the Society will continue its premiums to such districts in the year 1833. The same provisional continuance for the year 1832 was intimated last year with reference to the 11th, 12th, 13th, and 14th districts, in which 1827 was the first year of competition. A certificate of the competition and premiums awarded at the two intermediate local shows, signed by at least two Members of the Society, must be transmitted to the Secretary of the Society, so as to be received by him on or before the 10th December each year, in order to entitle the districts to any claim for the fourth year's premium.

II.—SHEEP AND WOOL.

1. PREMIUMS FOR IMPROVING THE BREED OF SHEEP IN THE FOLLOWING DISTRICTS:—

1. *The Parishes of Inverarvon and Kirkmichael in Banffshire, and Cabrach and Strathdon in Aberdeenshire.*

2. *Countries of Glengarry, Abertarff, Stratharrick, and the parish of Urquhart in Inverness-shire, including the lands of Aberchalder and Dumnaglass, partly in Nairnshire.*

3. *The Isle of Sky, in Inverness-shire.*

4. *The District of Cowal, Argyleshire.*

5. *The pastoral districts in the shires of Selkirk, Mid-Lothian, Roxburgh, Peebles, and Dumfries, comprehended within the parishes specified in last year's advertisement.*

For the best Pen of 18 Ewes of the Black-faced breed, from 16 to 20 months old, the property of any tenant within the first and second districts, and which shall be certified at the respective competitions to have been at least one year in his possession, and to have been, during that year, grazed on the same kind of pasture with the remainder of the flock of the like age—Ten Sovereigns.

For the second best Pen in the said districts, as aforesaid—Seven Sovereigns.

For the third best Pen, as aforesaid—Three Sovereigns.

For the best Pen of fifteen two year old Cheviot Ewes, the property of any grazier within the third district, and which shall be certified at the competition to have been at least one year in his possession—Ten Sovereigns.

For the second best Pen in the third district, as aforesaid—Five Sovereigns.

For the best Pen of fifteen Cheviot Gimmers, or one-year olds, the property of any grazier within the third district, and which shall be certified at the said competition to have been at least twelve months in his possession—Ten Sovereigns.

For the second best Pen, as aforesaid—Five Sovereigns.

> The Premiums by the Society in the fourth and fifth districts, are to be awarded in 1829 and 1831, to the amount and for the same descriptions of stock as in 1827: In 1828 and 1830 they are to be given by the resident gentlemen and local associations.

The following Members of the Society are appointed Judges for awarding the Sheep Premiums in the three first districts. The Judges and Conveners in the fourth and fifth were intimated last year:—

FOR THE FIRST DISTRICT.—The Duke of Gordon; Sir Charles Forbes, Bart. M. P.; J. Forbes, Esq. M. P.; G. Macpherson Grant, Esq. of Ballindalloch and Invereshie; John Macpherson Grant, Esq. younger of ditto; Major Forbes of Inverernan; the Rev. Dr Forbes: John Anderson, Esq. of Candycraig; Lieutenant-Colonel Gordon, Inverlochy; William Gordon, Esq. Minmore; Captain Grant, Tombreckachie; Captain Macgregor, Delavorar; Mr Skinner, Drummin; Mr Grant, Ruthven; and any other Members in the district; three a quorum.—Mr Macpherson Grant, in his absence the Rev. Dr Forbes and Captain Macgregor, or either of them, to be Convener.

FOR THE SECOND DISTRICT.—Colonel the Hon. F. W. Grant, M. P. J. M. Grant, Esq. of Glenmoriston; James Grant, Esq. of Corrymony; Patrick Grant, Esq. of Lakefield; Simon Fraser, Esq. of Foyers; A. T. F. Fraser, Esq. of Abertarff; J. B. Fraser, Esq. of Gortuleg; J. L. Macgillevray, Esq. of Dumnaglass; Captain Cameron, younger of Letterfinlay; James Grant, Esq. W. S.; and any other Members in the district—Mr Grant of Glenmoriston, in his absence Mr Fraser of Abertarff, Convener.

FOR THE THIRD DISTRICT—Lord Macdonald; Right Honourable C. Grant, M. P.; J. N. Macleod of Macleod, Esq.; L. Mackinnon, Esq. of Corry; Alexander Macalister, Esq. of Strathaird; Major Allan Macdonald of Ardmore: John Macpherson, Esq. Portree; Captain Mackaskill of Rudunan; Captain Macleod, Gesto; Dr Farquhar Mackinnon; Neil Mackinnon, Esq.; the Rev. Mr Mackinnon, Slate, and Mr Elder, residing in Slate, and any other Members in the district; four a quorum—Lord Macdonald, and Mr Macleod of Macleod, and their factors in their absence, Conveners.

RULES OF COMPETITION.

The competition for the Premiums will take place on such days, between the 20th of July and 1st of November, as shall be fixed by the Conveners, with the advice of a quorum of their respective Committees; and the Conveners of the third and fifth districts are hereby empowered, with the same advice, to fix the places of competition for these districts. The Judges, in deciding the Premiums for Sheep, will have regard both to the wool and carcass of the animal. The regulations for Black Cattle Shows, in regard to fixing the competition; the previous intimations to Judges and Competitors; the placing of Stock, and the number of Competitors required for Competition—the power to make provisionally an allowance for Stock of merit, in the event of deficiency in number—authority to divide the three Premiums in the first, second, and fourth districts into four, and those to the two classes in each of the third and fifth districts into three—the first Premium, in either case, not being under Eight Sovereigns—the rules as to awarding first and second Premiums, and prohibiting Members acting as Judges who are also Competitors; the regulations relating to extra expences, and the manner in which the reports are to be certified and transmitted, are severally hereby declared to be applicable to the Premiums for Sheep.

The Sheep, exhibited for the Premiums in the third and fifth districts, must be certified to the satisfaction of the Judges of competition, to have been selected from hirsels consisting of at least fifty of the same kind and age; that such hirsel has not been, at any time, selected from the rest of the Competitor's stock, or reared from a hirsel of selected ewes; that the hirsel has not, at any time, been fed on turnips or other green crop, nor upon artificial grasses, nor differently treated from the whole stock of the respective ages belonging to the Competitor, it being the object of the Society to award these Premiums for Cheviot Sheep, reared exclusively upon hill pastures.

Tomintoul is fixed as the place of competition for the first district; Fort Augustus for the second, and Glendaruel for the fourth district.

The *Note* annexed to the Rules of Competition for the Premiums for Black Cattle, is applicable also to the second, third, fourth, and fifth Districts for Sheep, in which the Premiums will be continued by the Society, for an additional period, on the conditions specified in the said note.

2. SALVING SHEEP.

To the Proprietor or Tenant in Scotland, who shall, after clipping-time of 1828, and before Martinmas of the same year, report to the Society the most satisfactory result of the most extensive set of experiments, performed upon different lots of Sheep kept on hill farms, consisting of not fewer than ten in each lot, according to the different methods of salving or smearing,—such results having reference to the original cost of material, the comparative quality and condition of the animals after having undergone their respective trials, as well as the quantity and value of the wool left after smearing, cleaned and ready for the manufacturer's use—Ten Sovereigns.

For the second best report—Seven Sovereigns.

Reports, accompanied by proper documents, and certified by two members of the Society, in support of the several particulars therein detailed, must be lodged with the Secretary on or before the 10th December 1828.

3. SPAYING SHEEP.

1. To the Owner of Sheep in the counties of Ross, Cromarty, or Inverness, who shall, at clipping-time 1830, produce the greatest number of Ewes, not being less than 100, which, as lambs in spring 1828, have been subjected to the operation of spaying, and thereafter pastured in like manner as the other ewes of the same flock and age, until the period of competition—Twenty Sovereigns, or a piece of Plate of that value.

2. To the owner who shall produce the next greatest number as aforesaid, not less than 50—Fifteen Sovereigns.

3. To the owner who shall produce the third greatest number, not less than 30—Ten Sovereigns.

As these premiums have been offered in consequence of a request from the district, and with the view of ascertaining the advantages attending the measure, as a mode of management, on Store Farms, to a partial extent, an articulate report is wished of the various details. It is required that a certificate shall be transmitted by two members of the Society, who have examined the Sheep at clipping-time 1830, specifying their relative appearance in regard to the rest of the flock in point of size and condition, with any other particulars regarding the age when operated upon, the effect on the health of the animal, and other circumstances which may appear interesting; the certificate to be accompanied by the affidavit of the competitor, stating the number of lambs spayed in 1828, that those certified by the members of the Society are of that number, that they were along with the tups in autumn 1829, and that the operation has been effectual, and that from the time of spaying they have been distinguished from the rest of the flock by a distinct mark. The report, certificate, and affidavit to be lodged at the Society's Hall on or before 10th December 1830.

Where it may be impossible to obtain the attendance of two members of the Society, the certificate of one member and a Justice of the Peace will be sustained.

III.—WORK HORSES.

PREMIUMS FOR IMPROVING THE BREED OF DRAUGHT HORSES.

1. *The Eastern District of Fifeshire.*
2. *The County of Perth.*

For the best Stallion, from three to twelve years old, for the improvement of the Breed of Draught-Horses, *bona fide* the property and in possession of any person within the East District of Fifeshire, kept for the use of the district, and shewn within the same at such times and places as the Committee after named shall fix, from the 1st May to the 1st of August 1829—Ten Sovereigns.

For the best Mare for breeding Draught-Horses, *bona fide* the property and in possession of any tenant in the said District, from 1st January 1829 to the day of competition—Eight Sovereigns.

For the best three year old Colt or Filly, *bona fide* the property of and bred by any tenant in said district—Five Sovereigns.

For the best pair of three year old geldings, fit for coach or chariot, bred in the county of Perth, and to be shewn in 1828—Twenty Sovereigns.

RULES OF COMPETITION.

The times and places where the Stallions are to be exhibited for the use of and within the first district, and also the time and place of competition for the Premiums, are to be fixed by the Convener of the district, with the concurrence of at least a quorum of the Committee, and are to be published by the Convener at the church doors in due time, or in such other manner as shall be thought, by the Convener and a quorum of the Committee, effectual for the information of those interested.

The Competition for the Premiums offered in the First District must take place betwixt 1st May and 1st August. The regulations for Black Cattle Shows, in regard to fixing the competition—the previous intimation to judges and competitors, the power of the judges to withhold the premiums if the animals produced shall be of inferior merit—those relating to extra expences—and against competitors being also judges—and the manner in which the report is to be certified and transmitted, are severally hereby declared applicable to the premiums for Horses.

The Competition for the Premiums in the Second District will take place on the day to be fixed for the Perthshire Agricultural Society's Show of Stock in 1828.

The following members of the Society are appointed a Committee for regulating every thing relative to these competitions, and judging thereat, viz.

For the First District.—The Earl of Leven and Melville; the Earl of Rosslyn; the Hon. General Charles Hope of Craighall; Sir John Oswald of Dunnikeir, Bart.; J. Balfour, Esq. of Fernie; John Boswell, Esq. of Balmuto; Major J. Falconer Briggs of Strathairly: William Berry, Esq. of Tayfield; General Durham of Largo; R. Ferguson, Esq. of Raith; James Heriot, Esq. of Ramornie; Charles Kinnear, Esq. of Kinnear; J. W. Melville, Esq. of Mountmelville; D. Maitland Makgill, Esq. of Rankeillour; J. Home Rigg, Esq. of Morton and Downfield: Colonel Oswald; Archibald J. Stewart, Esq. St Fort; Andrew Thomson, Esq. younger of Kinloch; Captain Wemyss named at a meeting to be called by the Conveners for the purpose, at such convenient time and place as the Conveners may appoint. A report of the award of the premiums to be lodged with the Secretary of the Society, on or before 10th December next.—J. J. Hope Johnstone, Esq. of Annandale, in his absence the Reverend Dr Singer and James Bell, Esq. of Woodhouselees, to be Conveners.

CLASS VII.

COTTAGES.

1. PREMIUMS TO COTTAGERS FOR THE CLEANLIEST KEPT COTTAGE.

DISTRICTS.

1. *The County of Sutherland.*
2. *The County of Roxburgh.*
3. *The Counties of Ross and Cromarty.*
4. *The County of Dumfries.*

In order to excite the attention of cottagers to keeping their cottages neat and clean, Ten Premiums, of Two Sovereigns each, will be awarded to *Ten* Cottagers in *each* of the above districts, paying L. 5 of rent or under—or whose cottage and land annexed to it does not exceed that annual value—who shall be certified by two members of the Society, resident in the district, or by one member of the Society and the clergyman of the parish, to have been distinguished for the general neatness and cleanliness of his or her cottage, and on that account to be *deserving* of this mark of the Society's approbation.

CONDITIONS.

The certificate must bear. that the cottage has been personally inspected by the parties granting it, and must give some description of the merits of the cottager, in respect of the manner in which the cottage has been kept, specifying, at the same time, the name, designation, and residence of the competitor. For the First and Second Districts, the certificates must be transmitted to the Secretary of the Society on or before the 10th of December 1828, and for the third and fourth, on or before the 10th December 1829.

Should there be more than ten Competitors in each district, the Society will be influenced by the circumstances of the case in deciding what claims are to be preferred: but in every case their decision will have regard exclusively to the neatness and cleanness with which the cottage has been kept, and not to its construction, or the materials of which it is composed.

2. PREMIUMS TO COTTAGERS FOR PROMOTING ATTENTION TO THE CULTIVATION AND MANAGEMENT OF BEES.

DISTRICTS.

1. *The Counties of Aberdeen and Kincardine.*
2. *The Counties of Perth and Forfar.*

To the Cottager in the first District, paying L. 5 of rent or under, or whose cottage and land annexed to it does not exceed that annual value, who, between 1st of June and 1st October 1828, shall have raised the greatest number of Hives of Bees, not fewer than seven, from stocks his or her own property, none of the hives weighing under 20 lb., exclusive of the weight of the material of the hive or skep—A premium of Five Sovereigns.

To the Cottager in the same District who shall have raised the second greatest number as aforesaid—Three Sovereigns.

To the Cottager in the same District who shall have raised the third greatest number as aforesaid—Two Sovereigns.

> Certificates of the number of Hives, and their several weights, making allowance for the weight of the skeps (which are to be weighed before being used), signed by two members of the Society, resident in the neighbourhood, or by one member and the clergyman of the parish, to be transmitted to the Secretary on or before 10th December 1828.

Similar Premiums will be given in the Second District for Hives raised between the 1st June and 1st October 1829.

> In order to make the Premiums to Cottagers for the cleanliest kept Cottages, and also those for promoting attention to Bee Husbandry, known among the class of persons for whose benefit they are intended, and without which it is obvious they must be in a great measure inoperative, it is earnestly requested that the Clergymen of the different parishes comprehended within the districts will give the Premiums publicity in such manner as they may consider most effectual and expedient; and with regard to the Premiums for cleanly kept Cottages, that they will farther take the trouble of communicating the names of such Competitors as they may deem deserving.

CLASS VIII.

WOODS AND PLANTATIONS.

1. HONORARY PREMIUM FOR PLANTING.

To the Proprietor who shall communicate to the Society on or before the 10th of November in any year, a satisfactory Report on the Planting of Land, founded on experiment; and who shall accordingly have planted on his own property an extent of not less than thirty acres, within a period of five years preceding the date of his report—The Gold Medal.

It is required that the report shall relate more especially to the tract of land which forms the subject of the communication, detailing the necessary particulars regarding its soil, climate, and exposure; the kinds, age, and number of the plants used; the mode of planting adopted, and the expences of the work;—and the writer is invited to state those more general observations on the principles and practice of planting, which his knowledge and experience on the subject may enable him to communicate.

2. RAISING THE PINUS SYLVESTRIS FROM SEED.

To the Nurseryman or other person in Scotland, who shall, between the 30th October 1826 and 30th October 1829, have raised on rather poor nursery-ground, and sold for planting, the greatest number of plants, not being fewer than three millions, of the *Pinus Sylvestris*, from seed imported from Norway, and taken off healthy trees in that country, or taken off healthy and free growing trees of the natural grown pine in the Highland districts of the counties of Aberdeen, Moray, and Inverness—Twenty Sovereigns, or a Piece of Plate of that value.

For the second greatest quantity as aforesaid—Ten Sovereigns.

Competitors to transmit to the Secretary of the Society, on or before 10th November 1829, affidavits in support of the collection of the seed, specifying the quantity, and the district in which it was collected—certificates, signed by two members of the Society, specifying the soil and thriving state of the plants in the nursery-ground, and an affidavit of the number of plants sold to be planted out for timber, and to whom they were disposed of. Competitors are requested to attend to a paper on the *varieties* of *Pinus sylvestris*, by the late Mr Don of Forfar, published in the Memoirs of the Caledonian Horticultural Society, vol. i. p. 121.

3. RAISING LARCH FROM SEED.

To the Nurseryman or other person in Scotland, who shall, between 30th October 1826 and 30th October 1829, have raised and sold for planting the greatest number of plants, not being fewer than one million, of the *Pinus Larix*, or Larch Fir, from seed imported from the Tyrol, or other regions of the Alps to which it is indigenous, and taken off healthy trees in that country—Thirty Sovereigns, or a Piece of Plate of that value.

For the second greatest quantity as aforesaid—Ten Sovereigns.

Certificates similar to those for the *Pinus sylvestris* to be transmitted on or before 10th November 1829.

4. PLANTING ASH AND SCOTCH ELM FOR TIMBER.

To the Proprietor in Scotland who, from 1st October 1826, to 1st November 1829, shall have planted the greatest number, not less than ten thousand, of Ash or Scotch Elms, and effectually fenced the same, in order to raise Timber—A Piece of Plate of the value of Twenty Sovereigns, with a suitable inscription.

For the second greatest number as aforesaid—A Piece of Plate of the value of Ten Sovereigns.

Certificates, subscribed by two members of the Society, specifying the healthy condition of the plants, the nature of the ground, the kind of fence, and the expence thereof, and supported by an affidavit from the person who superintended the planting, specifying the number of trees, and the age at which they were planted (not to be less than two-year old seedlings, at least one year transplanted in the nursery ground), with the mode of planting them, to be transmitted to the Secretary of the Society on or before 10th December 1829.

In the event of no sufficient competition for the Premiums Nos. 2 and 3, within the period now fixed, the Society has it in view to extend the period.

CLASS IX.

IMPLEMENTS OF HUSBANDRY AND USEFUL MACHINES.

To the Person who shall invent or improve any Instrument or Machine applicable to Husbandry or Rural Economy, and which, from its utility in saving labour or expence, simplicity and cheapness of construction, or other circumstances, shall be deemed by the Society deserving of public notice—The Silver Medal, or such sum in money as the communication shall appear to deserve.

The account of the implement must be accompanied by a model, to be deposited in the Society's museum.

CLASS X.

GENERAL SHOW OF LIVE STOCK,

AND

AGRICULTURAL MEETING AT GLASGOW,

IN 1828.

The Society having resolved to continue a General Show of Live Stock, Exhibition of Implements, and Roots and Seeds for Agricultural Purposes, and having fixed the Meeting to be held at Glasgow in the present year, the following Premiums by the Society, aided by a liberal donation from the Lord Provost and Magistrates of the City of Glasgow, and the unapplied surplus at the last meeting there, are offered to be then awarded, for Stock reared and fed by Proprietors or Tenants in any part of Scotland, and *bona fide* the property of the Exhibitors.

CATTLE.

AYRSHIRE OR DAIRY BREED.

CLASS I.—For the best Bull of the Ayrshire breed, not under three, and not exceeding six, years old—Fifteen Sovereigns, or a Piece of Plate of that value.

For the second best Bull, of the same age—Five Sovereigns.

II.—For the best Bull of the Ayrshire breed, not under 24, nor exceeding 40, months old—Ten Sovereigns.

For the second best Bull, of the same age—Five Sovereigns.

III.—For the best Milch Cow of the Ayrshire breed, not under three years old—Ten Sovereigns, or Plate of that value.

IV.—For the best two yearling Heifers of the Ayrshire breed—Ten Sovereigns, or Plate of that value.

For the two second best ditto—Five Sovereigns.

V. For the Ox of the Ayrshire breed, not under three, and not exceeding six years old, showing most symmetry, fat, and weight—Ten Sovereigns, or Plate of that value.

VI.—For the best two Oxen of the Ayrshire breed, not under three years old, regard being had to symmetry and size only—Ten Sovereigns, or Plate of that value.

VII.—For the best two Steers of the Ayrshire breed, not exceeding 40 months old—Ten Sovereigns, or Plate of that value.

WEST HIGHLAND BREED.

VIII.—For the best Bull of the true West Highland breed, not exceeding five years old—Fifteen Sovereigns, or a Piece of Plate of that value.

IX.—For the Ox of the West Highland breed, not under four, and not exceeding six, years old, shewing most symmetry, fat, and weight—Ten Sovereigns, or Plate of that value.

For the second best ditto—Five Sovereigns.

X.—For the best two Cows of the West Highland breed, not exceeding six years old, and not otherwise fed than on grass for four months preceding the day of exhibition—Ten Sovereigns, or Plate of that value.

XI.—For the best two Heifers of the West Highland breed, not exceeding 42 months old—Ten Sovereigns, or Plate of that value.

GALLOWAY BREED.

XII.—For the best two Oxen of the Galloway breed, not under three years old, showing most symmetry, fat, and weight—Ten Sovereigns, or Plate of that value.

XIII.—For the best two Heifers of the Galloway breed, not exceeding 30 months old—Ten Sovereigns, or Plate of that value.

XIV.—For the best two Spayed Heifers of the Galloway breed, not under three years old, showing most symmetry, fat, and weight —Ten Sovereigns, or Plate of that value.

SHEEP.

XV.—For the best three Tups of the Black-faced breed, not exceeding 40 months old—Ten Sovereigns, or Plate of that value.

XVI.—For the best five Black-faced Wedders, not exceeding five years old—Ten Sovereigns, or Plate of that value.

XVII.—For the best Pen of five Black-faced Ewes, not exceeding 42 months old—Five Sovereigns.

PIGS.

XVIII.—1. For the best Boar—Seven Sovereigns.
2. For the best Breeding Sow—Five Sovereigns.
3. For the best two Pigs, not exceeding 40 weeks old—Five Sovereigns.

HORSES.

Premiums for Horses, in a district limited, to be awarded on the day of the Show,—

XIX.—For the best Mare above five years old, of the *Clydesdale breed, bona fide* the property, and in the possession, of any landholder or tenant in the counties of Renfrew, Lanark, Stirling, Dumbarton, and Ayr, from the 1st January 1828, to the day of competition—Ten Sovereigns, or Plate of that value.

For the second best ditto—Five Sovereigns.

XX.—For the best three year old Gelding or Filly, of the same breed, bred by the competitor, or within the district, as above described, and under the same conditions as to property and possession—Ten Sovereigns, or Plate of that value.

For the second best ditto—Five Sovereigns.

EXTRA STOCK.

For Extra Stock of any kind, not shown for any of the above Premiums, and not exceeding, in any one lot, five Cattle, or ten Sheep, Premiums will be awarded and apportioned by the Committee and Judges in Money, Plate, or Honorary Medals, to the value in whole of Twenty Sovereigns.

IMPLEMENTS, ROOTS, SEEDS, &c.

Premiums in like manner, for Roots, Seeds, and for Agricultural Implements, or ingenious Machines of any kind, applicable to the uses of Agriculture, to the value in whole of Fifteen Sovereigns.

GENERAL REGULATIONS FOR THE SHOW.

1. The Competition will take place at Glasgow, on Wednesday the 24th of September next, within the Cattle Market there, a little east of the Barracks. The cattle will enter by the gate from Duke Street.

2. The name, residence, and post town of the Exhibitor, the name of the Breed, the number of the Class in which the Animals are to be exhibited, their age, and, in the case of Fat Stock, the kind of food upon which they have been fed, must be regularly certified, and the Certificate, signed by the Exhibitor, must be duly lodged as required by Article 3d.—The name and residence of the Breeder, and the Pedigree of the Stock, as far as known, must also be given.

3. The Certificates must be lodged with the Secretary before 12 o'clock on Thursday, the 18th September, at which time a list will be made up by him; and no Stock shall be allowed to enter into competition, or to be shown, which is not included in that list. *Printed forms* of certificates may be had on application at the Society's Hall, No. 6. Albyn Place, Edinburgh, or of James Cleland, Esq. Council Chambers, Glasgow. On or before Wednesday, the 17th September, the Secretary will be at the Tontine Hotel, Glasgow, to answer inquiries, attend to details, and to receive certificates.

In the mean time, certificates may be lodged with him at Edinburgh, or with Mr Cleland at Glasgow.

4. A responsible person, on the part of the Exhibitor, must attend when the Certificates are lodged, to give explanation if it should be necessary, and receive instructions as to matters of detail at the Exhibition. The person or persons so attending must be acquainted with the various particulars required to be certified regarding the Stock of which they are in charge, more especially the mode of feeding in the case of Fat Stock; and it shall be competent to the Committee to require the Exhibitor, or the person in charge of the Stock, to confirm the Certificates upon oath on the day of Competition, in such cases as they think necessary.

5. A ticket or order will be delivered by the Secretary to the person in charge of each lot, for its being received into the Show Yard; and no Stock whatever can come within the premisses without such warrant. One servant only for each lot can be admitted, and who must afterwards continue in charge of that lot in the Show Yard. *Bulls* must be secured by a ring or screw in the nose, with a chain or rope attached, otherwise they cannot be admitted into the Show Yard.

6. The *Oxen* exhibited for the Premiums must not have been fed on distillery wash or grains; and the *Sheep* must have been no otherwise fed than on grass, turnips, or hay. The description of food upon which the *Pigs* have been fed must be mentioned.

7. The distance each Ox travels to the Show, and the date of being put to fatten, to be mentioned.

8. A competitor may show more than one lot in any class, but shall not gain more than one Premium for Stock in the same class. It shall not be competent to enter a lot in one class, and afterwards to withdraw it for competition in another, unless by directions of the Committee.

9. Gentlemen intending to exhibit *Extra Stock*, must likewise intimate to the Secretary, and describe the Stock to be shown, six days before the competition. *Sweepstakes* to be reported at the same time, in order that proper Judges may be appointed, and other necessary arrangements made.

10. The Stock exhibited will not be distinguished in the Show Yard by the name of the breeder, feeder, or owner (until after the premiums are decided), but by Tickets or *Numbers* to be affixed to each lot, corresponding to the list to be made up by the Secretary.

11. The Committee of the Society appointed to conduct the arrangements for the Show, will appoint skilful persons to act as Judges for the several classes, and to report to the Committee the lots which, in their opinion, are entitled to the premiums.

12. The Committee of the Society, and the Judges to be named by them, will begin to view the Stock on the 24th September, at ten o'clock A. M. precisely; and, to prevent confusion, the different lots must be brought to the ground at or before eight o'clock in the morning.

13. On their arrival at the gate in Duke Street, instructions will be

given as to the particular part of the Show Yard to be occupied by each Class. After the Cattle are put up in the Show Yard, this gate will be shut, and is not to be opened until after the Exhibition, for the purpose of allowing Stock to be withdrawn, or on any other account whatever. The Stock will be withdrawn and the Show Yard shut at four o'clock.

14. Persons intending to exhibit Implements, Roots, or Seeds, must communicate with the Secretary, and lodge with him a memorandum descriptive of the articles to be shown, at least five days before the Meeting.

The following Members of the Society are appointed a Committee for regulating all details connected with the Agricultural Meeting, and Show of Stock at Glasgow.

The Duke of Hamilton and Brandon, President of the Society; the Duke of Montrose; the Marquis of Bute; the Earl of Glasgow; Lord Blantyre; Lord Belhaven; Lord Douglas; the Lord Justice Clerk; Lord John Campbell; the Lord Provost of Glasgow: Colonel the Honourable Charles Douglas; Sir Michael Bruce, Bart.; Sir Michael Shaw Stewart, Bart. M. P.; Sir John Maxwell of Pollok, Bart.; General Sir James Stewart, Bart.; Sir James Colquhoun, Bart.; Sir David Hunter Blair, Bart.; Sir Charles Macdonald Lockhart, Bart.; Sir Archibald Campbell, Bart.; H. Macdonald Buchanan, Esq. of Drummakill; Archibald Campbell, Esq. of Blythswood, M. P.; General Campbell of Lochnell; W. F. Campbell, Esq. of Islay, M. P.; Mungo Nutter Campbell, Esq. of St Catharines; James Cleland, Esq; LL. D.; H. Home Drummond, Esq. M. P.; James Dennistoun, Esq. of Golfhill; Robert Dalglish, Esq.; James Ewing, Esq. of Dunoon Castle, LL. D.: Kirkman Finlay, Esq. of Castle Toward; Alexander Garden, Esq. of Croy; Ludovic Houstoun, Esq. of Johnstone; T. F. Kennedy, Esq. of Dunure, M. P.; Colonel Elliot Lockhart, of Cleghorn, M. P.; C. G. S. Menteath, Esq. of Closeburn; Henry Monteith, Esq. of Carstairs; R. A. Oswald, Esq. of Auchincruive; James Smith, Esq. of Jordanhill; William Smith, Esq.; General Graham Stirling; Archibald Speirs, Esq. of Elderslie; Robert Wallace, Esq. of Kelly, and the officers of the Society.

A Vice-President of the Society and a deputation of the Directors, will be at Glasgow early on the day preceding the Exhibition.

FORM OF CERTIFICATE ABOVE REFERRED TO AS APPLICABLE TO FAT OXEN.

I near in the county of do certify, That my Ox (or Oxen, as the case may be), of the breed, to be shewn for the Premium in Class was bred by Mr of ;—he is now years and months old, and was fed by me on and has not, at any time, been fed on distillery wash or grains. He will have to travel miles or thereby, from the place of feeding to the show at Glasgow. He was first put up to fatten on or about the day of

Witness my hand this day of 1828.

Signature of the Exhibitor. }

Any observations as to the animal's appearance, and state of flesh when put up to feed, or other particulars which the Exhibitor may think material, and more especially the pedigree of the cattle, may be subjoined to the above certificate. The certificates for breeding stock, and for horses, sheep, and pigs, will be varied in conformity to the regulations applicable to these descriptions of stock.

INSTRUCTIONS TO THE JUDGES.

1. Upon their arrival in the Show-yard, the Judges will assemble in the apartment provided for their accommodation, until it is intimated to them that all arrangements preparatory to their proceedings to view the Stock, are completed.

2. Without inquiry as to the names of parties or places, the Judges are to determine, by reference to the *numbers* affixed to each lot by the Secretary.

3. The Secretary is understood to have satisfied the Committee of the regularity and correctness of the certificates produced, before granting the warrant for the Exhibition: and the Judges, therefore, must proceed upon that evidence, without reference to any other person. They will state, however, for the information of the Committee, if any of the Stock, in their opinion, does not come within the regulations prescribed for the Competition, so that such further inquiry may be made as the Committee may think necessary.

4. In forming their judgment, the Judges will have regard to the symmetry, size, early maturity, and qualities characteristic of the different breeds they have to judge of; making due allowance for age, feeding, and circumstances peculiar to the cases which come before them.

5. In no case shall a premium be adjudged unless the Judges shall deem the Lot to have *sufficient merit;* more especially if one Lot only is presented for any of the Premiums.

6. Having formed their opinion, the Judges will sign and deliver in their Report; and having done so, they are not afterwards to propose any change, nor disclose their opinion, till announced by the Committee. In the event of a difference of opinion, the majority shall be conclusive.

7. When the Report is delivered over to the Committee, the duty of the Judges shall cease, and it will devolve on the Committee finally to award the Premiums, and their award shall be immediately announced.

GENERAL SHOW OF LIVE STOCK

AT

PERTH, IN 1829.

The Society having resolved to hold the General Show of Live Stock for 1829 at Perth, the following Premiums are offered to be then awarded by the Society, aided by a donation of Fifty Guineas from the City of Perth, and liberal votes from local Agricultural Associations, connected with the adjoining districts. The Stock to be shewn must have been reared and fed by proprietors or tenants in Scotland, and *bona fide* the property of the exhibitors.

The Competition to be held at Perth, on the first Wednesday of October 1829.

CATTLE.

SHORT-HORN BREED.

Class I. For the best Bull, of the pure short-horn breed, not under two, and not exceeding six years old—Fifteen Sovereigns, or a Piece of Plate of that value.

II. For the best Cow, of the same breed, not under four, and not exceeding eight years old—Ten Sovereigns, or Plate of that value.

III. For the Ox, of the same breed, shewing most symmetry, fat, and weight, not exceeding four years old—Ten Sovereigns, or Plate of that value.

IV. For the Ox, of any breed crossed with the short-horn, showing most symmetry, fat, and weight—Ten Sovereigns, or Plate of that value.

V. For the best two Heifers, of the pure short-horn breed, not exceeding thirty months old—Ten Sovereigns, or Plate of that value.

ANGUSSHIRE BREED.

VI. For the best bull of the Angus breed, not exceeding six years old—Fifteen Sovereigns, or a Piece of Plate of that value.

VII. For the best breeding Cow, of not under four, and not exceeding eight years old—Ten Sovereigns, or Plate of that value.

VIII. For the best pair of Oxen of the same breed, shewing most symmetry, fat, and weight—Ten Sovereigns or Plate of that value.

ABERDEENSHIRE BREED.

IX. For the best pair of Oxen of the Aberdeenshire breed, shewing most symmetry, fat, and weight—Ten Sovereigns, or Plate of that value.

HIGHLAND BREED.

X. For the best Bull of the Highland breed, not exceeding five years old—Fifteen Sovereigns, or a Piece of Plate of that value.

XI. For the best breeding Cow, not under four, and not exceeding six, years old—Ten Sovereigns, or Plate of that value.

XII. For the best two Oxen, not under five, and not exceeding six, years old, shewing most symmetry, fat, and weight—Ten Sovereigns, or Plate of that value.

XIII. For the best two Heifers, not exceeding forty months old—Ten Sovereigns, or Plate of that value.

XIV. For the best two Oxen which have never been housed, not exceeding forty months old—Ten Sovereigns, or Plate of that value.

FIFESHIRE BREED.

XV. For the best breeding Cow, not under four, and not exceeding eight, years old—Ten Sovereigns, or a Piece of Plate of that value.

XVI. For the best pair of Oxen, not exceeding five years old—Ten Sovereigns, or Plate of that value.

AYRSHIRE BREED.

XVII. For the best Bull of the Ayrshire breed, not under 24, nor exceeding 60 months old—Fifteen Sovereigns, or a Piece of Plate of that value.

XVIII. For the best breeding Cow, not under four, and not exceeding eight years old—Ten Sovereigns, or Plate of that value.

SHEEP.

LEICESTER BREED.

Class XIX. 1. For the best Tup, not under 20, and not exceeding 60 months old—Ten Sovereigns, or Plate of that value.

2. For the best Pen of three Ewes, not exceeding four years old—Five Sovereigns.

3. For the best Pen of three Wedders, not exceeding three years old—Five Sovereigns.

SOUTHDOWN BREED.

Class XX. 1. For the best Tup, not under 20 and not exceeding 60 months old—Ten Sovereigns, or a Piece of Plate of that value.

2. For the best Pen of three Ewes, not exceeding four years old—Five Sovereigns.

3. For the best Pen of three two-shear Wedders—Five Sovereigns.

BLACKFACED BREED.

Class XXI. 1. For the best Tup of the black faced breed, not exceeding 60 months old—Ten Sovereigns, or Plate of that value.

2. For the best Pen of three Ewes, not exceeding four years old—Five Sovereigns.

3. For the best Pen of three Gimmers—Five Sovereigns.

4. For the best Pen of three fat Wedders, not exceeding five years old—Five Sovereigns.

5. For the best Pen of three Fat Wedders, of any cross with the blackfaced breed, not exceeding four years old—Five Sovereigns.

PIGS.

CLASS XXII. 1. For the best Boar—Five Sovereigns.

2. For the best Sow—Five Sovereigns.

HORSES.

CLASS XXIII. 1. For the best breeding Mare for agricultural purposes—Ten Sovereigns, or Plate of that value.

2. For the best three year old entire Colt, ditto—Ten Sovereigns, or Plate of that value.

3. For the best three year old Filly—Five Sovereigns.

CLASS XXIV. 1. For the best Mare, not exceeding fourteen hands 3 inches, adapted to agricultural purposes in those Highland and Mountainous districts adjoining to or within the range of the Grampians—Ten Sovereigns, or Plate of that value.

2. For the best three year old Colt, of the same breed—Five Sovereigns.

EXTRA STOCK, IMPLEMENTS, ROOTS, AND SEEDS.

For *Extra Stock*, of any kind, and for Implements of Husbandry, Roots, and Seeds, under the same Regulations as fixed for the meeting at Glasgow, Honorary Medals, or Premiums, to the amount of Twenty Sovereigns.

THE VETERINARY SCHOOL.

This Establishment is now in its fifth year of operation, under the Lecturer appointed by the Society, Mr William Dick, a graduate of the Veterinary College of London. Its practical utility has already been fully ascertained. Young men from various parts of the country have received instruction in the most approved and scientific modes of shoeing, in the anatomy and diseases of the horse and other domestic animals, and in the best system of treatment and cure. Several of these students have been sent up by Agricultural Associations, and others have attended on their own account. It may be interesting also to members of the Society to be informed, that Mr Dick is at present delivering a set of Lectures at a forenoon hour; to a numerous class of gentlemen, with such success, that it will probably also become an annual course.

The Lectures and Demonstrations for the Session 1828-29 will be commenced in November next.

By order of the Directors,

CHARLES GORDON, *Dep. Secy.*

PREMIUMS

OFFERED BY

THE HIGHLAND SOCIETY OF SCOTLAND,

FOR PROMOTING

AGRICULTURE AND INTERNAL IMPROVEMENT IN SCOTLAND,

IN

1829.

P. NEILL, PRINTER.

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PRELIMINARY NOTICE.

The business of The Highland Society of Scotland is conducted by a President, Four Vice-Presidents, Thirty Ordinary, and Ten Extraordinary Directors, a Treasurer, and Principal and Depute Secretaries, to which latter all communications are addressed. The Ordinary Directors are subdivided into Committees for the despatch of business, assisted occasionally by those Ordinary Members most conversant with the subjects to be discussed. The Report of each Committee is brought before the Directors collectively for farther procedure, and these proceedings are again submitted for approbation to a half-yearly General Meeting of the Society. New members are admitted at the General Meetings by ballot. They pay a small annual contribution of L. 1 : 3 : 6, or, in their option, and in full of all future claims, a life-subscription of Twelve Guineas. All Meetings of Directors, or Committees, are open; and at these, any member may attend and deliver his opinion on the subjects under consideration, though, in cases of division, the Directors or Members of the Committees only are entitled to vote. Members have access to the Society's Library, which is annually increasing, by the purchase or donation of books connected with the purposes of the Institution.

When the Highland Society of Scotland was instituted in the year 1784, the object chiefly contemplated was the improvement of the Highlands—and hence its name. But the great increase in the number of its Members since that time, the happy management of its funds, and the change in the general state of the country, have long enabled it to extend the design of its first institution, and direct attention to every part of North Britain where industry might be excited, or the useful arts improved.

The Society has, neither by its Charter of Incorporation, nor by its subsequent practice, been limited in its patronage to any one department of industry; but it has regarded, as the fitting objects of encouragement, every application of useful labour which might tend to the general good. But although its patronage be thus extended as regards its objects, circumstances have arisen to modify, in some cases, the application of it. The establishment of certain Boards, as that for the encouragement of the Herring Fishery, and the like, has induced the Society to restrict its original views, and to devote its attention, and apply its funds, in a more especial manner to other objects, and chiefly to Agriculture, and Rural Economy in its various branches.

In fulfilment of its purposes, the Society is every year accustomed to offer and award a variety of Premiums, as the means of eliciting and diffusing knowledge, as incitements to industry, or as the rewards for useful undertakings. These relate to every subject which may be supposed to fall within the plan of the Institution:—such are, the improvement of the Waste Lands of the Country, by Tillage, by Irrigation, or by Draining,—the Extension of Plantations, as the objects of ultimate profit, or of present embellishment and shelter,—

the improvement of the Breeds of Live Stock, and of the qualities of Wool,—the encouragement of certain domestic Manufactures,—the invention of Useful Machines,—and, not the least in interest and importance, the awakening the Industry of the Lower Ranks to such pursuits as shall promote their content, by ameliorating their condition.

Although certain subjects be thus selected as the objects of experiment or discussion, the Patronage of the Society is not restricted to these objects. Its purpose being the promotion of general industry and improvement, it receives with favour every beneficial communication and every statement of facts which may admit of an useful application. A Mechanical Department exists for rewarding the original invention or subsequent improvement of all machines and implements for Agricultural purposes, the construction of those for other branches of Rural Economy, and of some for domestic convenience. Models of these are received and preserved; and it is proposed, that, for the future, descriptions shall as speedily as possible be conveyed to the Public of all such as may merit attention.

The Transactions of the Society have hitherto been printed by Volumes, of which Six have been already published, and which may be had of Messrs CADELL and Co. of Edinburgh, successors to the interest held by Messrs CONSTABLE and Co. in the Copy-right, and by whom they will be furnished to Members at 25 per cent. under the selling price.

The Papers of the Society will hereafter appear periodically in "THE QUARTERLY JOURNAL OF AGRICULTURE, AND THE PRIZE ESSAYS AND TRANSACTIONS OF THE HIGHLAND SOCIETY OF SCOTLAND," published by Mr BLACKWOOD of Edinburgh, Mr CADELL of London, and Messrs CURRY and Co. Dublin.

All Communications relating to Premiums, and other subjects for the consideration of the Directors, are to be addressed to CHARLES GORDON, Esq. Depute-Secretary, at the Society's Hall, Albyn Place, Edinburgh.

NOTICE TO CANDIDATES,
AND GENERAL REGULATIONS OF COMPETITION.

When Subjects are specially selected for Competition, it is always to be understood, 1*st*, That, however concisely the subjects themselves be announced, ample information is required concerning them; 2*d*, That this information shall be founded on experience or observation, and not on simple references and quotations from books; 3*d*, That it shall be digested as methodically as possible; and, 4*th*, That Drawings, Specimens or Models, shall accompany Writings requiring them for illustration.

Certain conditions are annexed to each of the various subjects of competition, as detailed in the List of Premiums; and these are rigidly enforced by the Society, as the only means of ensuring regularity in the conduct of the business, and of distributing exact justice among the Competitors.

In all Essays for Competition, it is expected that when facts not generally known are stated, they are to be authenticated by proper references. Competitors in Essays shall not communicate their names, but shall transmit along with the Essays a sealed note containing their names and addresses, and inscribed on the back with some distinguishing motto or device, which shall also be inscribed on the Essay. When this regulation is neglected, such Essay shall not be received in competition. If the Essayist has formerly gained a Premium from the Society for a Paper communicated by him, it is recommended that his subsequent Essay shall be written in a different hand from that of the former successful Paper.

None of the sealed notes, except those which bear the distinguishing motto or device of the Essays found entitled to Premiums, shall be opened; and such as are not found entitled to any premium, shall, with the sealed notes, be returned to the authors, if required. The Society is to be at liberty to publish the Essays, or Extracts from them, for which the Premium, or part of it, shall be awarded.

Candidates are requested to observe, that, in any instance, when Essays, Reports, or Certificates, are unsatisfactory, the Society is not bound to give the reward offered; and that, in certain cases, power is reserved of giving such part only of a Premium as the claim may be adjudged to deserve; but Competitors may feel assured that the Directors will always be inclined to judge liberally of their several claims.

In all Reports of Experiments relating to the Improvement or Management of Land, it is expected that the *expences* shall be accurately detailed.

In the enunciation of all Premiums, having reference to Weight or Measure, the New or Imperial Standards are alone to be understood as referred to; and should Competitors in any instance refer to other Weights or Measures, the exact proportion which these bear to the New Standards must be accurately specified, otherwise the claim will not be entertained.

When Premiums are awarded in Plate, the Society will, in such cases as the Directors may see proper, allow them to be paid in Money, on the application of the successful Candidates.

OFFICERS AND DIRECTORS, 1829.

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His Grace ALEXANDER, DUKE of HAMILTON and BRANDON.

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Those marked thus * were elected at the last Anniversary Meeting.

PREMIUMS, &c.

Highland Society Hall,
Edinburgh, 9th February 1829.

THE HIGHLAND SOCIETY OF SCOTLAND does hereby advertise, That the under-mentioned PREMIUMS are to be given by the Society in the year 1829, &c.

ESSAYS AND REPORTS.

1. THE CONSTRUCTION OF THE PLOUGH.

A Piece of Plate, of Fifty Sovereigns value, will be given for the best and approved Essay on the Construction of the PLOUGH, founded on experiment, and deduced from mathematical principles.

The Essay to be accompanied by Drawings or Models illustrative of the subject; and the writer will be required to explain the properties and mode of action of the machine, and to describe, in distinct detail, the form, size, and position of its various parts.

To every well formed Plough these properties ought to belong; 1st, It ought to perform the operation intended in a proper manner, and to this end to possess a sufficient degree of strength; 2d, Its parts ought to be so constructed as to be best able to resist the shocks and pressure to which they are subject; and, 3d, They ought to be so combined as to perform the work required with the least resistance. Further, the instrument ought to be no heavier than is consistent with the strength necessary, and as simple in its form as its nature will allow. The power of performing the operation well is the first of these properties to be regarded in the plough, while, in proportion as it possesses the others, may its form be held to be more or less perfect. The Essay to be lodged on or before the 20th October 1829.

2. THATCHING WITH HEATH AND WITH FERN.

A Piece of Plate, of Ten Sovereigns value, will be given for the best and approved Essay on Thatching with Heath and with Fern or Bracken, from actual experience and observation.

The Society is led to believe, that both Heath (*Calluna vulgaris*) and Fern (*Pteris Aquilina*) are very effectual and durable as Thatch, and that, in many situations, particularly in the Highlands, where a great deal of straw, that might otherwise be available as food for stock, is consumed as thatch—heath or fern might be substituted with advantage—and occasionally also for slate, in situations where it is only to be procured with difficulty, and at great expence. The Society is therefore desirous to have a minute and satisfactory account of a proper method of using the heath and the fern respectively, as Thatch—including the most expedient slope or pitch of roof—the durability of the materials, and the expence.—The Essay to be lodged on or before 20th October 1829.

3. DISEASE IN TURNIPS.

A Piece of Plate, of Fifteen Sovereigns value, will be given for the best practical Essay or Report on the Disease called Anbury, or "Fingers and Toes," so destructive of the turnip-crop in some of the best turnip districts.

The Essay must be founded upon the personal knowledge of the Author, and is expected to point out a probable preventive for the disease.—To be lodged on or before 20th October 1829.

4. CULTURE OF LUCERNE.

A Piece of Plate of Ten Sovereigns value, will be given for the best and approved Essay on the necessary culture for raising Lucerne (*Medicago sativa*) in Scotland, stating the most suitable Soils, as well as others upon which it may be grown with advantage.

The Society having reason to believe that Lucerne, although hitherto grown on a limited scale, and little known in Scotland, may be cultivated with great advantage, in many situations, is desirous of having the best practical information on the subject. It is therefore required that the facts stated, and the mode of cultivation recommended, shall be authenticated by reference to actual experiment. Competitors will also advert to the quantity of produce, the best mode of consuming the crop, its effect as food in fattening stock, and all circumstances and information regarding the properties of the plant, which may be useful for the guidance of those who may cultivate Lucerne.—The Essay to be lodged on or before the 20th October 1829.

5. CONSTRUCTION OF LIME-KILNS.

A Piece of Plate, of Fifteen Sovereigns value, will be given for the best and approved Report, founded on experiment, on the construction of Lime-kilns, comprehending the most recent improvements thereon, and pointing out the means by which the greatest quantity of lime may be obtained with the least consumption of fuel.

It would be satisfactory also that the Essayist should advert to the different varieties of fuel used in burning lime, according to local circumstances.—The Essay, accompanied by a model of the kiln recommended, to be lodged on or before 20th October 1829.

6. APPLICATION OF LIME.

A Piece of Plate, of Twenty Sovereigns value, will be given for the best and approved Essay, founded on experiment in Scotland, on the most beneficial mode of applying Lime to the different varieties of soil, under various descriptions of culture and crop, both with respect to the quantity as well as to the frequency of the application.

The Essays to be accompanied by an analysis of the lime employed, or a sample of the limestone, in the unburned state, from which it had been made.—The Essay to be lodged on or before 20th October 1830.

7. STOCKING OF PASTURES.

A Piece of Plate, of Twenty Sovereigns value, will be given for the best and approved Essay, founded upon experience in Scotland, regarding the proportion, species, and description of Live Stock which may be most advantageously pastured together in enclosed grass land.

A principal object to be had in view, is the clean eating of the grass, with a due regard, at the same time, to the fattening and thriving of the different animals, and the periods found best for opening and shutting up such pasture lands. A particular statement will be required of the number, age, or value of the animals when put to grass; the length of time they were severally pastured, and their price or value when removed, with any other information which may tend to elicit the object in view. It is also required that the extent of pasture in each enclosure be specified, with the nature of the soil, surface, length of time in pasture, and mode of management when laid out for grass. It will farther be desirable, in as far as competitors can conveniently ascertain, to know the particular grasses that constitute the pasture, and any thing remarkable in regard to the destruction of weeds, should any such have been found troublesome.—The Essay to be lodged by 20th October 1830.

8. DISEASE IN CATTLE CALLED THE "RED-WATER."

The Gold Medal, or Ten Sovereigns, will be given for the best and approved Essay upon the Causes, Prevention, and Cure of that disorder in Cattle called the Red-water, or Moor-ill.

The Essay to advert to the description of cattle most liable to be attacked with this disorder,—the season of the year, and the kind of food most likely to cause it; and likewise to describe the morbid appearances of those cattle that die of this disease, or more particularly of those parts affected. The Essay to be lodged by 20th October 1830.

9. DISEASE IN SHEEP CALLED "THE LOUPING-ILL."

The Gold Medal, or Ten Sovereigns, will be given for the most correct statement of well authenticated facts, relative to the disease in Sheep known in the south border counties by the name of the "Louping-ill," divided into the following heads, viz.

The varieties of the disease, the appearance externally, and on dissection; on what soils it appears most frequently, and if any soil is quite exempt from it; the period of the year when the disease is most prevalent, the state of the atmosphere in regard to humidity, cold, and wind; is it induced by change of pasture, and how? What preventives or what remedies have been attempted, and the success that has attended them; what effect the size of the animal has upon the disease; and, in general, any other information tending to elucidate the subject. The Report to be lodged by 20th October 1830.

10. DISEASE OF "FOOT-ROT" IN SHEEP.

The Gold Medal, or Ten Sovereigns, will be given for the most correct account of well authenticated facts, relative to the disease in Sheep denominated the "Foot-rot," bearing upon the following points:—

The varieties of the disease, what are its first symptoms, and how far it affects the general health of the animal. The cause, so far as is supposed; the reasons for assigning such cause as the actual one. Whether the disease is in any degree hereditary or contagious, and whether an animal having once had it is more susceptible of a return? What is the precise seat of the disease, and in what season of the year is the animal most subject to attack. The preventives most usually adopted, and to what extent they have been successful. The cure, or the means successfully used in the treatment of the disease. What pastures or soils are most subject to the disease, and, if any soil is exempt from it—at what season is it most prevalent; and, in general, any information that may be of use in the investigation of the complaint. The Essay to be lodged on or before 20th October 1831.

11. COLLECTING AND PRESERVING THE SEEDS OF FOREST TREES.

A piece of Plate, of Twenty Sovereigns value, will be given for the best and approved Essay, (founded, as much as possible, on the writer's personal experience), on the subject of collecting and preserving the seeds of Forest Trees, suited to the climate of Scotland; the best mode of extracting the seeds from the cones of the pine tribe, and the mode of sowing the seeds, and bringing forward the young plants, until they be ready for planting out.

It is expected, that, in describing the manner of collecting cones and seeds, the proper season for gathering each kind will be pointed out, and the manner of removing them with least injury to the parent tree, also the degree of heat, as indicated by reference to Fahrenheit's thermometer, to which the cones may be subjected, without injury to the vegetative powers of the seed; and that the most easy and economical mode of extracting, cleaning, and preserving the various seeds, will be fully detailed, and the indications pointed out of the fitness of seeds for successful germination: The modes of sowing the different kinds of seeds, and the depth of earth by which they should be covered, the quantity of seed to be put on the square yard, or other given measure, the period and mode of transplanting into nursery lines, and the time during which each kind should remain in such lines, with other particulars necessary for shewing the best means of bringing the seedlings to the state ready for being planted out, must be satisfactorily detailed.

It is expected, that where the writer does not found the information communicated on his own experience, he will refer to well authenticated facts. Attention must be especially directed to the trees most valued for their economic uses; but it would be highly desirable also to obtain information regarding any of the rarer species which may seem suited to the climate of the country.

The following deciduous forest-trees may be enumerated as claiming attention, and regarding which the author is invited to communicate his remarks, in so far as his experience and means of observation extend: Oak, Ash, Wych or Scotch Elm, English Elm, Beech, Sycamore, Larch, Corsica Pine or Laricio, Sweet Chesnut, Birch, Walnut, Horse Chesnut, Alder, Mountain Ash or Roan, Hornbeam, White Thorn, Elder or Bourtree, Broad Leaved or Scots Laburnum, Swedish Maple, and White Beam. Among evergreen trees may be mentioned Holly, Evergreen-Oak, and some of the principal cone-bearing trees, such as the Scotch Fir (best variety), Norway Spruce, Silver Fir, Pinaster, Weymouth Pine, Cedar of Lebanon, White American Spruce, &c. Some kinds of forest-trees, which, in this country, are generally propagated by layers or cuttings, may also be noticed as well deserving of attention, namely, Lime Tree, Poplars of different kinds (Lombardy, Black Italian, White Egyptian, Balsam, and Ontario), Willows of different kinds, Tulip Tree, and Oriental and Occidental Plane. The Essay to be lodged by 20th October 1831.

12. HONORARY PREMIUM FOR AN ACCOUNT OF ANY DISTRICT IN SCOTLAND.

To the person who shall, on or before the 20th of October in any year, furnish to the Society the best account of any district in Scotland, with reference to the present state of Husbandry, and the progress of rural and general improvement, the Society's Silver Medal, or a piece of Plate, as the Directors may see fit, in the circumstances of the case.

In describing the present state of Husbandry in the district, the writer is required to advert to the general character of the soil and surface,—to direct attention especially to the more recent improvements that have been made, or that may be in progress, in the modes of tillage, the breeds of stock, the state and management of roads, the progress of plantations, and the like; and generally to offer such suggestions as may admit of practical application regarding the future improvement of the district.

CONDITIONS OF COMPETITION.

The conditions of Competition for Essays and Reports will be found under the "General Notice to Candidates," prefixed to the List of Premiums, and to which Competitors are referred.

The Essays and Reports on Subjects 1, 2, 3, 4, and 5, are to be lodged at the Society's Hall, on or before the 20th of October next 1829; those on subjects 6, 7, 8, and 9, by 20th October 1830; those on Subjects 10 and 11, by 20th October 1831, and Reports on Subject 12, by the 20th of October in any year.

EXPERIMENTS AND IMPROVEMENTS,

CLASS I.

STRAW PLAIT MANUFACTURE.

RAISING STRAW FOR THE MANUFACTURE.

1. For the best specimens in a bleached state, of *Rye* Straw, raised in Scotland, for the purpose of being manufactured into Plait, for Imitation Leghorn Bonnets—Ten Sovereigns.

For the next best specimen, not being from the same Competitor—Five Sovereigns.

2. For the best specimen, in a bleached state, of Straw actually raised in Scotland, from the *Grano marzolano*, or kind of wheat cultivated in Tuscany for this purpose; or any other species of wheat affording a culm of equal fineness, pliancy and toughness—Ten Sovereigns.

CONDITIONS.

The specimens to be put up in bundles of not less than two inches diameter; and to be lodged at the Society's Hall on or before the 10th December next, with a narrative of the circumstances of their growth and preservation, and certificates satisfactorily signed, of the facts therein detailed. It is expected that the specimens produced by each competitor shall have been selected from a crop grown to the extent of at least half an acre.

Intending Competitors will receive a copy of a memorandum containing some interesting information which has been communicated to the Society, on certain points of management in the growth and preparation of the Straw used in the Tuscan trade, upon calling at the Society's Chambers.

CLASS II.

WASTE LANDS.

1. HONORARY PREMIUM FOR IMPROVEMENT OF LAND FOR TILLAGE.

To the Proprietor or Tenant in Scotland, who shall, on or before the 10th of November in any year, transmit to the Society a satisfactory report of his having, within the period of five years immediately preceding the date of his communication, successfully improved and brought into tillage, an extent of waste and hitherto uncultivated Land, not being less than one hundred acres—The Gold Medal.

> The Report may comprehend such general observations on the improvement of Waste Land as the writer's experience may have led him to make; but is required to refer especially to the particular tract reclaimed, to the nature of the soil, the previous state of the ground, the obstacles opposed to its improvement, the mode of management adopted, the expence, and, in as far as can be ascertained, the produce and value of the subsequent crops; and the land must have borne one crop of grain at least, previous to the year in which the Report is made. The Report must be accompanied by a certified measurement of the ground.

2. DRAINING MOSS AND BOG LAND.

FIRST DISTRICT. *The Upper Ward of Lanarkshire.*
SECOND DISTRICT. *The County of Aberdeen.*

To the Person, in the First District, who shall, between 1st March 1827 and 1st October 1829, have executed, in an effectual manner, the greatest extent, not less than 6000 yards, of Drain, in Moss or Bog Lands, and with a view to the amelioration of the climate, as well as to the improvement of the soil—A Piece of Plate of Twenty Sovereigns value.

For the next greatest extent as aforesaid, not less than 3000 yards—A piece of Plate of Ten Sovereigns value.

To the Person in the Second District, who shall, between 1st March 1829 and 1st October 1831, have executed the greatest extent, not less than 6000 yards, as aforesaid—A Piece of Plate of Twenty Sovereigns value.

For the next greatest extent, in the Second District, as aforesaid, not less than 3000 yards—A Piece of Plate of Ten Sovereigns value.

> Competitors will observe, that these Premiums being offered chiefly with a view to the amelioration of the climate, the Society understands them to apply, not to hill and pasture grounds, which may be improved by surface or sheep drains, but to those tracts of flow moss and bog lands, usually situated at a lower level, and frequently with nearly a flat surface; and that, to entitle a proprietor to either of the premiums, in preference to a tenant who shall have executed

the drainage chiefly at his own expence, the proprietor must have drained double the extent of the tenant.

The extent of surface drained must not be under forty acres for the first, and twenty acres for the second premium, in either district. It is required that the ground so drained shall be effectually cleared of stagnant water and superabundant moisture; and, in as far as circumstances will admit, rendered fit for planting, raising grain, or producing useful herbage for the pasturing of cattle and sheep.

Certificates in favour of Competitors, specifying the above particulars, to be subscribed by two Members of the Society, who shall have seen the state of the ground previous to, and at the conclusion of, the operations, accompanied with a particular account, verified by affidavit, respecting the extent and description of the drains executed, their general depth and width; the state of the ground previous to, at different stages, and conclusion of, the operations; the mode in which the same were executed; the expence,—and, in the case of a tenant, what part thereof is allowed by the landlord; with any other circumstances connected with the subject, of which it may appear material that the Society should be informed. Certificates for the First District must be transmitted to the Secretary on or before the 10th November 1829; and, for the Second District, on or before the 10th November 1831.

3. FORMING MEADOWS FROM MOSS BY IRRIGATION CHIEFLY.

To the Tenant in Scotland who shall have succeeded best in creating a productive Meadow from Peat Moss, not being less than Five Acres, and regularly affording crops of Hay, by Irrigation chiefly—Ten Sovereigns.

The process pursued, and the nature, quality, and amount of the produce, to be specifically detailed and confirmed by the affidavit of the Reporter, and the certificates of at least two Members of the Society belonging to the neighbourhood—Reports to be transmitted to the Secretary by the 10th November 1829.

4. FORMING MEADOWS FROM MOSS BY OTHER MEANS.

To the Tenant of lands who shall have succeeded best in creating a productive Meadow from Peat Moss, by *other means than Irrigation*, not being less than Six Acres—Ten Sovereigns.

The mode of improvement, nature, and quality, and amount of produce, and the easiest mode of saving the seeds for the formation of a similar meadow, to be all detailed in a Report, and the facts authenticated by the affidavit of the Reporter, and certificates of two Members of the Society in the vicinity.—Reports to be transmitted to the Secretary by 10th November 1829.

CLASS III.

CROPS AND CULTURE.

1. NEW PLANTS ADAPTED TO FIELD CULTURE.

To any person who shall, on or before the 20th October in any year, report to the Society any new species or variety of useful Plant, adapted to the ordinary field culture of Scotland, the Silver Medal, or a piece of Plate, as the Directors may see fit, in the circumstances of the case.

> Satisfactory evidence will be required, that the plant produced is new in the cultivation of the country, either as regards the species or variety,—valuable as regards the uses to which it may be applied, and congenial to the soil and climate of Scotland. A particular detail of the discovery or circumstances which led to the experiment, must be furnished,—the mode of culture described, and a specimen of the plant transmitted.

2. RAISING GREEN CROPS IN THE FOLLOWING DISTRICTS, VIZ.

1. *The District of Strathspey, in Inverness-shire and Morayshire.*
2. *The Island of Bute.*

To the actual farmer, being a tenant in each of the said two districts, renting lands not exceeding L. 15 yearly, who shall have had the greatest extent, not less than One Acre, of his arable land sown down with a crop of Red Clover and Rye Grass in 1828, (the field having been under a crop of Turnips, properly manured, and three times hoed in the preceding year), and the Grass so laid down being made into Hay in 1829, for the first year's cutting—Three Sovereigns.

To the actual farmer, being a tenant in each of the said districts renting lands above L. 15 and under L. 40 yearly, who shall have had the greatest extent, not less than Three Acres, of his arable land, treated and sown down as aforesaid, and the crop made into Hay in 1829, for the first year's cutting—Five Sovereigns.

To the actual farmer, being a tenant in each of the said districts, renting lands from L. 40 to L. 100, who shall have had the greatest extent, not less than Five Acres, treated and sown down as aforesaid, and the crop made into Hay in 1829, for the first year's cutting.—Seven Sovereigns.

To the actual farmer, being a tenant in each of the said districts, renting lands above L. 100, who shall have had the greatest extent, not less than Seven Acres, treated and sown down as aforesaid, and the crop made into Hay in 1829, for the first year's cutting—Ten Sovereigns.

Certificates for these Premiums are to be subscribed by two Members of the Society, or by one Member, along with a Justice of the Peace, and must specify all particulars above noticed, with any other circumstances relative to the mode of cultivation which may appear material. It is required that they shall also specify the amount of rent paid by the tenant; and in the event of the whole, or a part thereof, being payable in grain, it is to be converted into money at the fiar prices of the counties for the preceding year. The certificates must farther state, that the land, when under turnips, had been properly manured for that crop; and give the opinion or estimate of the Reporters of the probable produce of hay per acre; and it is expected that the land shall have been limed. By "actual farmer" is meant a person who makes his livelihood principally by farming as a stated and ordinary occupation. Certificates for the two Districts to be transmitted to the Secretary by the 10th November 1829.

3. FEEDING OFF TURNIPS BY SHEEP.

The Society being of opinion that the practice which obtains in some districts in England, and of the south of Scotland, of feeding off Turnips on the ground by Sheep, may be advantageously introduced into other districts, and in certain soils and situations, offers the following premiums, in the districts after mentioned, viz.

1. *The Moulinearn, Dunkeld, and Blairgowrie Districts of Perthshire.*
2. *The District of Aberdeenshire and Kincardineshire, on both sides of the River Dee, comprehending the Parishes of Nigg, Banchory-Devenich, Maryculter, Peterculter, Durris, Drumoak, Upper Banchory, Strachan, Kincardine O'Neil, Lumphanan and Aboyne.*
3. *The Crieff District of Perthshire, comprehending the Parishes of Crieff, Monyvaird, Strowan, Comrie, Monzie, Madderty, Trinity-Gask, and Fowlis Wester.*

To the farmer in the first district, *south* of the road leading from Dunkeld to the Bridge of Ruthven, passing Forneth and Blairgowrie, who, in the year 1829, shall have cultivated in drill the greatest extent of Turnips, not being under ten acres, in proportion to the extent of his land under the plough that year, and of which at least one half shall be eat off on the ground by the feeding of sheep, carefully and regularly inclosed with hurdles, and upon land well adapted to the purpose—Ten Sovereigns.

To the farmer *north* of the same road, who shall cultivate and feed off the greatest extent as aforesaid, not being less than four acres—Five Sovereigns.

To the farmer in the second district, who shall, in the year 1828, have cultivated the greatest extent of turnips in drill, estimated as aforesaid, not being under ten acres, and of which at least one-half shall be eat off on the ground, in manner before specified —Ten Sovereigns.

To the farmer in the second district, who shall have cultivated and fed off the next greatest extent, not less than four acres—Five Sovereigns.

To the farmer in the third district, who shall, in the year 1829, cultivate the greatest extent of turnips in drill, estimated as aforesaid, not being under ten acres, and of which at least one-half shall be eat off on the ground in manner before specified—Ten Sovereigns.

To the farmer in the fourth district, who shall cultivate and feed off the next greatest extent, not less than four acres—Five Sovereigns.

In any portion of the field reserved to be fed off by sheep, the blanks left by the turnips removed shall not exceed five drills, so as the benefit of this mode of feeding arising from the treading and manure of the stock so fed, may be distributed over the whole of such portion.

Competitors for crop 1828 will transmit to the Secretary of the Society, on or before 10th November 1829, an affidavit, specifying the extent of ground under turnips, the kind or kinds raised, the proportion fed off by sheep, the manner in which it was done, and within what period; description of sheep so fed, and whether they were the claimant's own stock, or were sent for feeding by another, and, in the last case, the price obtained per acre will be stated; the affidavit to be accompanied by a certificate of two Members of this Society, in support of the matters therein detailed.

The like certificates, as referable to crop 1829, to be transmitted by 10th November 1830.

4. SOILING SHEEP.

A Gold Medal, or Piece of Plate, of Ten Sovereigns value will be given for the best and approved Report of an experiment for ascertaining the relative advantages between the systems of soiling and grazing sheep.

The Reports will specify the number and description of the sheep selected for the experiment, and are to be lodged on or before 10th November 1830.

5. CULTIVATION OF FIELD BEET OR MANGEL WORZEL.

A Gold Medal or Piece of Plate, of Ten Sovereigns value, will be given for the best and approved account of an experiment, or series of experiments, on the cultivation of Mangel Worzel, and on its application to the purposes of feeding Dairy-Cows or other Live Stock.

Reports detailing the various particulars specified in the conditions annexed to this Premium in the list of Premiums for 1828, must be lodged with the Secretary by 10th November 1829.

6. BONE MANURE.

1. To the person in Scotland, *south of the Forth*, who, in the year 1828, shall have raised the greatest breadth, and greatest average weight per acre, of Turnips, by means of bone manure alone, not less than twenty acres—Twenty Sovereigns, or a Piece of Plate of that value.

For the second greatest extent and weight, not under ten acres —Ten Sovereigns, or Plate of that value.

2. To the person in Scotland, *north of the Forth*, who shall have raised the greatest extent and weight of Turnips, as aforesaid, not under ten acres—Ten Sovereigns, or a Piece of Plate of that value.

For the second greatest extent, north of the Forth, not under five acres—Five Sovereigns, or Plate of that value.

Reports detailing the various particulars specified in the conditions annexed to this class in the list of Premiums for 1828, accompanied by the certificates and affidavits therein required, to be lodged with the Secretary on or before the 10th November 1829.

7. EXPERIMENTS WITH SALTPETRE AS A MANURE.

For the best Essay or Report, founded on actual experiment, on the effects of the application of Nitre or Saltpetre as a Manure or Top-dressing to land under crop, and the nature of its action on the same—The Gold Medal, or Ten Sovereigns.

It would be desirable to distinguish the experiments as made upon the different kinds of crop, such as Wheat, Barley, Oats, Pease, Clover and Rye-grass, Lucerne, Meadows and Pasture Ground. The extent not to be less than one acre, and a comparison made upon one acre more of the same field, using lime, soot, or other top-dressing,—the quantities of each manure, period, mode of application and expence, to be accurately detailed, and the apparent improvement, if any, by the nitre, certified on inspection by two Members of the Society. Reports to be lodged by 10th November 1831.

8. PLOUGHING COMPETITIONS.

The Highland Society finding that Premiums to Ploughmen for improvement in ploughing, have for some years been given very generally over the country by the resident gentlemen and Local Agricultural Societies, has, in the mean time, discontinued them; but being desirous of encouraging improvement in this branch of husbandry, the Society will give its Silver Medal to the Ploughman found to be the best at such competitions, provided not fewer than twelve Ploughs shall have started. The Medal will be issued upon a Report from one or more Members of the Society, who shall have actually attended the competition, stating the number of Ploughs that had started, and that the Ploughman found to be the best had not received the Society's Medal at a previous competition in the same district.

CLASS IV.

PASTURES.

1. LAYING DOWN LANDS TO PERMANENT PASTURE.

To the Proprietor or Tenant in Scotland who shall report the most successful experiment in laying down a field to permanent pasture, not being less than five statute acres, and which shall afford the best combination of the finer grasses, for giving a renewed succession of plants, in proportion to the advance of the season—Twenty Sovereigns, or a Piece of Plate of that value.

Reports adverting to the circumstances specified in the conditions detailed in the Society's list of Premiums for the years 1826, 1827 and 1828, must be lodged with the Secretary by 10th November 1829.

2. COMPARATIVE ADVANTAGES OF LAYING DOWN LANDS TO PASTURE WITH AND WITHOUT A WHITE CROP.

There being reason to believe that the sacrifice of a white crop in laying down lands to pasture, will, in many instances, be counterbalanced by the superior produce of grass, the Society is induced to offer the following Premium:

A Piece of Plate, of Twenty Sovereigns value, will be given for the best and approved comparative Report, founded upon actual experience in Scotland, of Land laid down to Pasture with the Native Indigenous Grasses, adapted to the particular soil, *without any white crop*, along with the Grass Seeds; and of Land in similar circumstancess of soil, climate, and condition, sown down with the same grasses, *along with a white crop.*

The extent of land in each experiment, not to be less than seven acres; and a particular statement is required of the kinds and quantities of the grass seeds used, with a distinct account of the kind and number of stock pastured upon each field, with their comparative progress in condition, for three successive seasons. The sort of grain sown as white crop must be likewise reported. A hay crop is of course excluded.—Reports to be lodged by the 10th November 1832.

3. LAYING DOWN THE POORER SOILS TO GRASS.

To the Tenant in Scotland who shall report the best practical experiment *in laying down the Poorer Soils to Grass,* and continuing them for some time in pasture, keeping in view the chance or necessity of breaking them up again for cultivation, when other soils might, in a similar way, require an occasional period of rest—Ten Sovereigns.

The process pursued, the expence incurred, and the nature and amount of the produce, to be specifically detailed and confirmed by the affidavit of the Reporter, and the certificate of at least two Members of the Society belonging to the vicinity.—Reports to be lodged with the Secretary by 10th November 1829.

4. TURNING UNCULTIVATED MOOR LAND TO PASTURE.

To the Tenant of Lands who shall have succeeded best in turning an Uncultivated Moor into a productive pasture, by Lime or other means, not being less than ten acres—Ten Sovereigns.

For the second best improvement of this kind—Five Sovereigns.

The mode of improvement, the time, expence, produce and other details, to be specifically reported, on the affidavit of the Reporter, and authenticated by at least two Members of the Society belonging to the neighbourhood.—Reports to be lodged by 10th November 1829.

5. SAVING THE SEEDS OF NATURAL GRASSES.

To the Seedsman or other person, who shall report to the Society the most sucsessful experiments in raising, in Scotland, for sale, the seeds of all, or any, of the following Natural Grasses, with the view of supplying the demand in laying down ground in the best way to permanent pasture, viz.

Anthoxanthum odoratum, or sweet-scented vernal grass.
Alopecurus pratensis, or meadow fox-tail grass.
Poa trivialis, or rough-stalked meadow-grass.
Festuca duriuscula, or hard fescue-grass.
Cynosurus cristatus, or crested dog's tail grass.
Dactylis glomerata, or cock's-foot grass.

—Ten Sovereigns, or a Piece of Plate of that value.

The whole ground devoted to the purpose, in one season, not to be less than one acre; and the experiment to be made on not fewer than three of these kinds of grasses; and it is recommended, that the seed shall be saved from crops which have been separately sown in drill, and kept clean by hoeings, from all mixtures of other grasses and weeds.—Reports confirmed by affidavit, and specifying the details of the experiments, the mode of raising the seed adopted, with the kinds and quantities produced and disposed of, and accompanied by specimens of the seed, to be lodged with the Secretary by 10th November 1829.

CLASS V.

LIVE STOCK.

I. CATTLE.—BREEDING STOCK.

PREMIUMS FOR IMPROVING THE BREED OF CATTLE IN THE FOLLOWING DISTRICTS.

1. *The Eastern District of Forfarshire, comprehending the Parishes of Montrose, Menmuir, part of Edzell, Carriston, Oathlaw, Arbroath, Lunan, Guthrie, Kinnell, Monifieth, Maryton, Brechin, Lethnot, Lochlee, Craig, Aberlemno, Carmylie, Panbride, Rescobie, Inverkeillor, Monikie, Farnwell, Fearn, Stricathro, Dun, Logie-Pert, Tannadice, Barrie, Kirkden, St Vigeans, and Arbirlot.*
2. *The Districts of Morven, Ardnamurchan, Sunart, and Kingerloch, in the county of Argyle.*
3. *The Districts of Moidart, Arisaig, and Knoidart, including the islands of Eig, Rum, and Canna, in the Counties of Inverness and Argyle.*
4. *The Islands of Shetland.*
5. *The West Teviotdale District in the counties of Roxburgh and Selkirk, comprehending the Parishes of Hobkirk, Kirkton, Cavers, Hawick, Roberton, Wilton, Southdean, Minto and Lilliesleaf.*
6. *Kinrosshire.*
7. *The District of Dumbartonshire west of the River Leven, comprehending the Parishes of Arrochar, Luss, Roseneath, Row, Cardross, and that part of the Parish of Bonhill on the right Bank of the River Leven.*
8. *Wigtonshire.*
9. *The Island of Arran.*
10. *The Districts of Mid and Nether Lorne, in the County of Argyll, comprehending the Parishes specified in the list of Premiums of last year.*
11. *Clackmannanshire, including the Parishes of Culross, Fossaway, Tulliallan, Muckhart, Logie and Glendevon, in the county of Perth, and Alloa in Stirlingshire.*
12. *The following Parishes in the counties of Stirling, Dumbarton, and Perth, viz. Drymen, Buchanan, Balfron,*

Gargunnock, St Ninian's, Kippen, Baldernock, Killearn, Strathblane, Fintry, Kilmaronock, East and West Kilpatrick, that part of Bonhill to the East of the Leven, Dumbarton, Aberfoyle and Port.

13. *The District of Kincardineshire, comprehending the parishes of Fettercairn, Fordoun, Marykirk, Garvock, Laurencekirk, Arbuthnott, Glenbervie, and that part of the parish of Edzell in Kincardineshire.*

14. *The District of Aberdeenshire, comprehending the parishes of Strathdon, Glenbucket, Cabrach, Towie, Tarland and Migvie, Logie Coldstone; those parts of the parishes of Coul and Tulloch, in Cromar; those parts of the parishes of Glenmuick, Glengarden, and Tulloch, and of Crathie, which are on Gardenside and in Morven.*

15. *The District of Buchan, in Aberdeenshire, from the River Ythan, on the south, to the River Doveran, on the north and west, including also the adjoining parishes of Logie-Buchan, Foveran, and Methlick, in the District of Fomartin.*

For the best Bull, from two to seven years old, *bona fide* the property, and in possession, of any proprietor or tenant in *each* of the nine Districts, Nos. 1, 5, 6, 8, 11, 12, 13, 14, and 15, as above described, kept on his farm within the District, from the 20th day of May preceding the day of competition—Ten Sovereigns.

For the second best Bull, of the age above specified, *bona fide* the property, and in possession, of any proprietor or tenant in *each* of the said nine Districts, and kept on his farm within the District, for the aforesaid period—Five Sovereigns.

For the best Bull, of the age above specified, *bona fide* the property, and in possession, of any tenant in *each* of the six Districts, Nos. 2, 3, 4, 7, 9, and 10, kept on his farm within the District, from the 20th day of May preceding the competition—Ten Sovereigns.

For the second best Bull, of the same age, in *each* of the said six last mentioned Districts, the property, and in possession, of any tenant, and kept on his farm within the District for the foresaid period—Five Sovereigns.

For the best *two* Queys, of two years old, the property of, and bred by, any tenant in each of the fifteen Districts above mentioned (Shetland, No. 4. excepted)—Five Sovereigns.

For the second best *two* Queys, of two years old, the property of, and bred by, any tenant in each of the fifteen Districts above mentioned (Shetland, No. 4. excepted)—Three Sovereigns.

For the best Quey, of two years old, the property of, and bred by, any tenant in the Shetland district, No. 4—Five Sovereigns.

For the second best Quey, of two years old, the property of, and bred by, any tenant in Shetland—Three Sovereigns.

The premiums in the 2d, 3d, 9th, and 10th districts, are limited to the West Highland breed; and for *Bulls* shewn in the 5th, to the Short-horn breed. The competition in the Districts Nos. 1 to 7, both inclusive, will take place in 1829:—In Nos. 8 to 15, both inclusive, the first competition under the system of alternate years having been held in 1828, the next competition will take place in 1830:—In the intermediate year, such premiums only as shall be given by the gentlemen of the respective Districts, or by local associations therein, are to be competed for.

The following Members of the Society (as Members only, or their Factors in their absence, can be named) are hereby appointed Judges for the seven Districts first above mentioned. In the eight last Districts, the Judges were named in the advertisement of last year.

FOR THE FIRST DISTRICT.—The Earl of Airly; the Honourable W. Maule of Panmure, M. P.; Lord Gillies; the Honourable W. Ogilvy; the Honourable D. Ogilvy; the Honourable Colonel John Ramsay of Dysart; Sir John Ogilvy of Inverquharity, Bart.; Sir James Ramsay of Bamff, Bart.; David Blair, Esq. of Cookston; David Blair, Esq. younger of Cookston; David Carnegie, Esq. of Craigo; James Carnegie, Esq. of Balnamoon; W. Fullarton Lindsay Carnegy, Esq. of Boysack; Thomas Drummond, Esq. younger of Newton; Alexander Greenhill, Esq. younger of Fearn; James W. Hawkins, Esq. Advocate; David Hunter, Esq. of Blackness; James L'Amy, Esq. of Dunkenny; George Lyon, Esq. of Glenogil; Gilbert Laing Meason, Esq. of Lindertis; John Ochterlony, Esq. of Gwynd; John Pattullo, Esq. of Longhaugh; George Robertson Scott, Esq. of Hedderwick; Captain Robert Scott of Abethune; Robert Spied, Esq. of Ardovie; Henry Stephens, Esq. of Balmadies; P. Wedderburn, Esq. of Newgrange; Mr Crow, Kincraig; and any other Members residing in the District: five a quorum. The Honourable William Maule, M P. Convener.

FOR THE SECOND DISTRICT.—Sir James M. Riddell, Bart; James Forbes, Esq. of Kingerloch; R. G. Macdonald, Esq. of Clanranald;

Colonel Robertson Macdonald of Kinlochmoidart; Campbell D. Riddell, Esq.; Hugh Maclean, Esq. younger of Coll; William Robertson, Esq. younger of Kinlochmoidart; John Gregorson, Esq. of Ardtornish; John Macdonald, Esq. of Glenalladale; and any other Members in the District: two a quorum.—Sir J. M. Riddell, Bart. Convener.

FOR THE THIRD DISTRICT.—Sir Duncan Cameron of Fassfern, Bart.; R. G. Macdonald, Esq. of Clanranald; John Macdonald, Esq. of Glenalladale; Angus Macdonald, Esq. younger of Genalladale; Colonel Robertson Macdonald of Kinlochmoidart; William Robertson, Esq. younger of Kinlochmoidart; Captain Gordon Cameron, of Letterfinlay; Alexander Macdonald, Esq. younger of Rhue; and Dr Maclean at Rum: three a quorum.——Mr Macdonald of Glenalladale, in his absence Mr Macdonald the younger of Glenaladale, to be Convener.

FOR THE FOURTH DISTRICT.—Lord Dundas; Sir Arthur Nicholson, Bart; Admiral Fraser; William Mowat, Esq. of Garth; Robert Bruce, Esq. of Symbister; John Bruce, Esq. younger of Symburgh; Robert Hoseason, Esq. of Mossbank; and any other Members in the District: two a quorum.—Mr Mowat of Garth, Convener.

FOR THE FIFTH DISTRICT.—His Grace the Duke of Buccleuch; The Earl of Minto; William Elliot Lockhart, Esq. M. P.; James R. Johnstone, Esq. of Alva; James Johnstone, Esq. younger of Alva; John C. Scott, Esq. of Synton; James Elliot, Esq. of Wolflie; George Cleghorn, Esq. of Weens; Archibald Dickson, Esq. of Huntlaw; Sir W. F. Elliot of Stobbs and Wells, Bart.; Charles B. Scott, Esq. of Woll; John Pringle, Esq. of Clifton; Thomas Stavert, Esq. younger of Hosecoat; Archibald Douglas, Esq. of Edderstone; and any other Members in the District: three a quorum.—The Duke of Buccleuch, in his Grace's absence, Mr Elliot of Wolflie, to be Convener.

FOR THE SIXTH DISTRICT.—The Lord Chief-Commissioner; Admiral Adam; Mr Commissioner Bruce of Arnot; Dr Coventry of Shanwell; The Reverend George Craig Buchanan of Mackeanston; and any other Members in the District: two a quorum.—Admiral Adam, Convener.

FOR THE SEVENTH DISTRICT.—Lord John Campbell; Sir James Colquhoun, Bart.; James Colquhoun, Esq. younger of Luss; R. C. Bontine, Esq. of Ardoch; J. C. Colquhoun, Esq. Sheriff of the

County; James Dennistoun, Esq. of Dennistoun; James Dennistoun, Esq. younger of Dennistoun; Alexander Dunlop, Esq. Advocate; John Horrocks, Esq. of Tillechewen Castle; J. R. Smollett, Esq. of Bonhill; Alexander Smollet, Esq. younger of Bonhill; James Smith, Esq. of Jordanhill.—Sir James Colquhoun, in his absence Mr Smollet younger of Bonhill, Convener.

For the Eighth, Ninth, Tenth, Eleventh, Twelfth, Thirteenth, Fourteenth and Fifteenth Districts, the Judges and Conveners remain as intimated last year; with the addition of those resident Members who have been since elected.

RULES OF COMPETITION.

1. The Conveners, with the approbation of a quorum of the Judges for conducting the several competitions, are respectively authorised, in such cases as they shall see proper, to divide the two premiums allowed for bulls into three premiums, in such proportions as they shall approve, the first premium for bulls not being less than Eight Sovereigns; and, in like manner, to divide the sums allowed for queys into three premiums, fixing their amount. In Shetland, the Judges are empowered to divide the premiums for bulls into four, the first not being under Six Sovereigns; and for queys, also into four, the first not being under Three Sovereigns.

2. The Judges shall not place for competition any stock which, in their opinion, does not fall within the regulations prescribed, or does not possess merit; and, in no instance, shall any of the premiums be awarded where there are not, after such selection, at least three competitors; reserving to the Judges, in the case here provided for, to make such allowance to a party shewing stock of merit, not exceeding half the amount of the premium, as, under the circumstances, they may think reasonable.

3. The times, and also the places of competition, are to be fixed by the Conveners, with the advice of, at least,] a quorum of their respective Committees; and the competitions are to take place between the 20th July and the 1st day of November next.

4. The Convener of each Committee will give timely notice to the other Judges of the District, of the place and time of competition; and will be particularly careful that the same be intimated at the several parish church-doors within the district for *at least two* successive Sundays previous to the competition.

5. As these premiums were given in some of the above mentioned districts in 1827, it is to be observed, that the Society does not admit an animal in any class of stock which may have gained a *first* premium in a former year, to be again shewn *in competition* in any district; and for no description of stock shall either the same or a lower denomination of premium be awarded in the district in which they have already gained such premium.

6. No Member of the Committee, shewing stock of his own at the competition, shall act as Judge, nor shall Factors, when they are Members of the Society, and are named Judges, or when acting as such in the absence of proprietors, compete for premiums in the district in which they are Judges, in those districts and classes in which proprietors are excluded from competition. In all cases, it s expected that the bulls for which premiums are awarded shall not be limited to serve the stock of the owner. The same person not to obtain more than one of he premiums for bulls, nor more than one of the premiums for queys, in one year.

7. In order to entitle the competitors to their respective premiums, a regular report, signed by the Convener and at least a majority of the Judges, who attend the competition, must be transmitted by the Conveners, so as to be received by the Secretary, on or before the 10th of December next, and which report must specify the ages of the Bulls and Queys preferred; the length of time the Bulls have been in the possession of the competitors; and, with respect to the Queys, that they were bred by the competitors, and were their property, on the day of competition; the number of Bulls and Queys respectively produced thereat; the number placed for competition; the names and designations of the persons to whom the premiums have been adjudged; amount of premiums voted to each; and, in general, that all the rules of competition fixed by the Society, as above mentioned, have been strictly observed; and, in particular, that the previous intimations to the Judges, and advertisements at church-doors, were regularly made, as required. In case all the Judges, who may have attended, shall not have subscribed the report, the Convener will mention the cause which may have prevented their doing so.

Farther, it is to be distinctly understood, that in no instance does any claim lie against the Society for expences attending a show of stock, beyond the amount of the premiums offered.

With reference to the competition in the 8th District, the Report must specify that the Bulls and Queys preferred were of the Galloway breed; in the 2d, 3d, 9th and 10th Districts of the West Highland breed; and in the 5th District, that the Bulls were of the pure Short Horn breed.

Conveners are requested to get the Reports drawn up and signed by a majority of the Judges present at the competition before they separate.

NOTE.—The Society being impressed with the benefit to be derived from continuing these competitions in the same districts for a longer period than had formerly been the practice, proposes to offer them in Districts 5th, 6th and 7th (in which the present is the first year's competition of the series), for the years 1831 and 1833; and provided the gentlemen of the districts, or any local association therein, shall continue the competitions, and award premiums in any of these three districts to the amount of not less than one-half of the Society's premiums, and to the same description of stock during the intermediate years 1830 and 1832, the Society will continue its premiums to such district in the year 1834. The same *provisional* continuance for the year 1832 was intimated in 1827 with reference to the 1st, 2d, 3d and 4th Districts, in which 1827 was the first year of competition; and a similar intimation of *provisional* continuance for 1833 was made last year for the Districts Nos. 8th to 15th, both inclusive, in which 1828 was the first year of competition. A certificate of the competition and premiums awarded at the two intermediate local shows, signed by at least two members of the Society, must be transmitted to the Secretary of the Society, so as to be received by him on or before the 10th December in each year, in order to entitle the Districts to any claim for the fourth year's premium.

II. SHEEP AND WOOL.

1. PREMIUMS FOR IMPROVING THE BREED OF SHEEP IN THE FOLLOWING DISTRICTS:—

1. *The District of Cowal, Argyleshire.*

2. *The following Parishes in the Counties of Mid-Lothian, Sel-*

kirk, Roxburgh, Peebles and Dumfries, viz. Stow, Galashiels, Selkirk, Ettrick, Yarrow, Roberton, Ashkirk, Hawick, Melrose, Cavers, Eskdale Muir, Manor, Tweedsmuir, Lyne and Megget, Traquair, Innerleithen and Peebles.

3. *The Parishes of Assynt, Tongue, Duriness and Edderachilles, in the County of Sutherland.*

4. *Countries of Glengarry, Abertarf, Stratharrick, and the Parish of Urquhart in Inverness-shire, including the lands of Aberchalder and Dumnaglass, partly in Nairnshire.*

5. *The Isle of Sky, in Inverness-shire.*

6. *The District of Forfarshire, called the Braes of Angus.*

For the best Pen of eighteen Gimmers or Ewes of the Black Faced breed, from sixteen to twenty months old, the property of any tenant within the First District, and which shall be certified at the competition to have been at least one year in his possession, and to have been, during that year, grazed on the same kind of pasture with the remainder of the flock of like age—Ten Sovereigns.

For the second best Pen, as aforesaid—Seven Sovereigns.

For the third best Pen, as aforesaid—Three Sovereigns.

For the best Pen of fifteen Cheviot Gimmers, in the Second District, bred upon moist grassy lands, according to the division of farms made by the Pastoral Society of Selkirkshire—Ten Sovereigns.

For the best second ditto—Five Sovereigns.

For the best Pen of fifteen Cheviot Gimmers, in the Second District, bred upon dry heathy lands, according to the same division—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

For the best Pen of fifteen Two Year Old Cheviot Ewes, the property of any grazier within the Third District, and which shall be certified at a competition to be held at Lairg, in August or September 1829, to have been at least one year in his possession—Ten Sovereigns.

For the second best Pen, certified as aforesaid—Five Sovereigns.

For the third best Pen, certified as aforesaid—Three Sovereigns.

The Premiums will be given by the Society in the Fourth and Fifth Districts in 1830 and 1832, and *provisionally* also for an additional year, if the resident gentlemen or local associations shall award Premiums in 1829 and 1831. The Society's Premiums in Skye will be for Black Faced Sheep; and in Glengarry, Abertarf, &c. for Cheviot Sheep, in pursuance of the suggestions of the resident Members. Premiums for Black Faced Sheep will be given by the Society in the Sixth, or Braes of Angus District, in 1830, for the first year of the series.

The following Members of the Society are appointed Judges for awarding Sheep Premiums in the three first Districts:—

For the First District.—General Lamont of Lamont; Kirkman Finlay, Esq. of Castle Toward; Robert Maclachlan, Esq. of Maclachlan; Mungo N. Campbell, Esq. of St Catherines; Archibald Campbell, Esq. of Drumsynie; John Campbell, Esq. of Southall; James Lamont, Esq. of Knockdow; James Finlay, Esq. younger of Castle Toward; Alexander Lamont, Esq. younger of Knockdow; James Ewing, Esq. of Dunoon Castle; Angus Fletcher, Esq. of Dunans; Archibald Campbell, Esq. of Glendaruel; George Wilson, Esq. of Innisnaruisk; James Hunter, Esq. of Halfton; John Fletcher, Esq. of Bernice; James Lamont, Esq.; John Campbell, Esq. of Strachur; Mr Macfarlane, Strachurmore, and any other Members in the District, five a quorum. Drumsynie and Maclachlan, or either of them—in their absence, Mr Lamont, younger of Knockdow—to be Conveners.

For the Second District.—The Duke of Buccleuch, the Earl of Traquair, Lord Napier, Lord Montagu, Sir Thomas Gibson Carmichael, Bart.; Sir John Hay, Bart.; Sir Walter Scott, Bart.; W. Elliot Lockhart, Esq. M. P.; Gilbert Innes, Esq. of Stow; R. N. Campbell, Esq. of Kailzie; James Pringle, Esq. of Torwoodlee; John Boyd, Esq. of Broadmeadows; John C. Scott, Esq. of Synton; John Pringle, Esq. of Clifton; Captain James Pringle, younger of Torwoodlee; John Borthwick, Esq. younger of Crookston; Alexander Pringle, Esq. of Whytbank; J. R. Johnston, Esq. of Alva; William Ogilvie, Esq, of Chesters; Thomas Macmillan, Esq. younger of Shorthope; Charles B. Scott, Esq. of Woll; Archibald Douglas, Esq. younger of Adderstone; Thomas Bruce, Esq. of Langlee; Thomas Stavert, Esq. of Hosecoat, and any other Members in the District, five a quorum. Lord Napier, in his absence, Mr Pringle of Whytbank, to be Convener.

For the Third District.—The Marquis of Stafford; Earl Gower; Lord Francis Leveson Gower, M. P.; Lord Reay; George Dempster, Esquire, younger of Skibo; Kenneth Mackay, Esq. of Torboll; Dugald Gilchrist, Esq. of Ospisdale; Hugh Lumsden, Esq. Sheriff of the county; Major Clunes of Crakaig; Thomas Houston, Esq. of Creich; George Gunn, Esq. Rhives; Gabriel Reid, Esq. Gordonbush, and any other Members in the District. Earl

Gower, in his Lordship's absence, the Factors in the District, to be Conveners.

The Judges in the Fourth and Fifth Districts were intimated last year: and those in the Sixth District will be intimated in the List of Premiums for 1830 :—the Earl of Airlie to be Convener in that District.

RULES OF COMPETITION.

The competition for the Premiums will take place on such days, between the 20th of July and 1st of November 1829, as shall be fixed by the Conveners, with the advice of a quorum of their respective Committees; and the Conveners of the first and second districts are hereby empowered, with the same advice, to fix the places of competition for these districts. The Judges, in deciding the Premiums for Sheep, will have regard both to the wool and carcass of the animal. The regulations for Cattle Shows, in regard to fixing the competition; the previous intimations to Judges and Competitors; the placing of Stock, and the number of Competitors required for Competition—the power to make provisionally an allowance for Stock of merit, in the event of deficiency in number—authority to divide the three Premiums in the first and third districts into four, and those in each of the two classes in the second district into three—the first Premium, in either case, not being under Eight Sovereigns—the rules as to awarding first and second Premiums, and prohibiting Members acting as Judges who are also Competitors; the regulations relating to extra expences, and the manner in which the reports are to be certified and transmitted, are severally hereby declared to be applicable to the Premiums for Sheep.

The Sheep, exhibited for the Premiums in the second and third districts, must be certified to the satisfaction of the Judges of competition, to have been selected from hirsels consisting of at least fifty of the same kind and age; that such hirsel has not been, at any time, selected from the rest of the Competitor's Stock, or reared from a hirsel of selected ewes; that the hirsel has not, at any time, been fed on turnips or other green crop, nor upon artificial grasses, nor differently treated from the whole stock of the respective ages belonging to the Competitor, it being the object of the Society to award these Premiums for Cheviot Sheep, reared exclusively upon hill pastures.

Lairg is fixed as the place of competition for the third district.

The *Note* annexed to the Rules of Competition for the Premiums for Cattle, is applicable also to the Districts for Sheep, in which the Premiums will be continued by the Society, for an additional period, on the conditions specified in the said note.

2. SPAYING SHEEP.

1. To the Owner of Sheep in the counties of Ross, Cromarty, or Inverness, who shall, at clipping-time 1830, produce the greatest number of Ewes, not being less than 100, which, as lambs in spring 1828, have been subjected to the operation of spaying, and thereafter pastured in like manner as the other ewes of the same flock and age, until the period of competition.—Twenty Sovereigns, or a piece of Plate of that value.

2. To the owner who shall produce the next greatest number as aforesaid, not less than 50—Fifteen Sovereigns.

3. To the owner who shall produce the third greatest number, not less than 30—Ten Sovereigns.

As these premiums have been offered in consequence of a request from the district, and with the view of ascertaining the advantages attending the measure, as a mode of management, on Store Farms, to a partial extent, an articulate report is wished of the various details. It is required that a certificate shall be transmitted by two members of the Society, who have examined the Sheep at clipping-time 1830, specifying their relative appearance in regard to the rest of the flock in point of size and condition, with any other particulars regarding the age when operated upon, the effect on the health of the animal, and other circumstances which may appear interesting; the certificate to be accompanied by the affidavit of the competitor, stating the number of lambs spayed in 1828, that those certified by the members of the Society are of that number, that they were along with the tups in autumn 1829, and that the operation has been effectual, and that from the time of spaying they have been distinguished from the rest of the flock by a distinct mark. Reports, certificates, and affidavits to be lodged at the Society's Hall, on or before 10th December 1830.

Where it may be impossible to obtain the attendance of two members of the Society, to examine the sheep in 1830, and certify the particulars required, the certificate of one member and a Justice of the Peace will be sustained.

III. WORK HORSES.

PREMIUMS FOR IMPROVING THE BREED OF DRAUGHT HORSES.

The Eastern District of Fifeshire.

For the best Stallion, from three to twelve years old, for the improvement of the Breed of Draught-Horses, *bona fide* the property and in possession of any person within the East District of Fifeshire, kept for the use of the district, and shewn within the same at such times and places as the Committee after named shall fix, from the 1st May to the 1st of August 1829—Ten Sovereigns.

For the best Mare for breeding Draught-Horses, *bona fide* the property and in possession of any tenant in the said District, from 1st January 1829 to the day of competition—Eight Sovereigns.

For the best three year old Colt or Filly, *bona fide* the property of and bred by any tenant in said district—Five Sovereigns.

RULES OF COMPETITION.

The times and places where the Stallions are to be exhibited for the use of and within the district, and also the time and place of competition for the Premiums, are to be fixed by the Convener, with the concurrence of at least a quorum of the Committee, and are to be published by the Convener at the church doors in due time, or in such other manner as shall be thought, by him and a quorum of the Committee, effectual for the information of those interested.

The Competition to take place betwixt 1st May and 1st August. The regulations for Cattle Shows, in regard to fixing the competition—the previous intimation to judges and competitors—the power of the judges to withhold the premiums if the animals produced shall be of inferior merit—those relating to extra expences—and against competitors being also judges—and the manner in which the report is to be certified and transmitted, are severally hereby declared applicable to the premiums for Horses.

The following members of the Society are appointed a Committee for regulating every thing relative to the competition, and judging thereat, viz.

The Earl of Leven and Melville; the Earl of Rosslyn; Sir John Oswald of Dunnikeir, Bart.; J. Balfour, Esq. of Fernie; John Boswell, Esq. of Balmuto; Major J. Falconer Briggs of Strathairley; William Berry, Esq. of Tayfield; General Durham of Largo; R. Ferguson, Esq. of Raith; James Heriot, Esq. of Ramornie; Charles Kinnear Esq. of Kinnear; J. W. Melville, Esq. of Mountmelville; D. Maitland Makgill, Esq. of Rankeillour; J. Home Rigg, Esq. of Morton and Downfield; Colonel Oswald; Archibald J. Stewart, Esq. St Fort; Andrew Thomson, Esq. younger of Kinloch; Captain Wemyss of Wemyss, M.P.; H. Wedderburn, Esq. of Wedderburn; and any other members in the district—the Earl of Leven, in his absence, Major Briggs of Strathairly, Convener.

IV. SWINE.

DISTRICT.—*The County of Dumfries.*

For the best Boar, not under twelve months, nor more than four years old, *bona fide* the property and in possession of any tenant in the county of Dumfries in autumn 1829—Seven Sovereigns.

For the second best—Three Sovereigns.

For the best breeding Sow of the same age, and on the same conditions—Four Sovereigns.

For the second best ditto—Two Sovereigns.

The competition to be held at such time and place as the Society's members resident in the county shall fix, at a meeting to be held by the Conveners, at such time and place as the Conveners may appoint. This Meeting is also authorised to name a Committee for managing all details, and to fix the necessary regulations for the competition. A Report of the award of the premiums, with a copy of the regulations of competition, to be transmitted to the Secretary on or before the 10th of December next.—J. J. Hope Johnstone, Esq. of Annandale, in his absence the Rev. Dr Singer, and James Bell, Esq. of Woodhouselees, to be Conveners.

CLASS VI.

PRODUCTS OF LIVE STOCK.

1. BEST MANAGED DAIRY IN THE COUNTY OF LANARK.*

To the Tenant in the county of Lanark who shall have kept the best managed Dairy, of not fewer than ten Cows, from 20th April 1829 to 20th April 1830—Thirty Sovereigns, or a Piece of Plate of that value.

To the Tenant who shall have kept the next best managed Dairy, as aforesaid—Twenty Sovereigns, or Plate of that value.

CONDITIONS.

1. Competitors shall furnish a report of the breed of the Cows, the *average weekly* return of milk, butter and cheese, from the whole cows kept on the farm; also a correct report, from actual trial, of the difference in quantity and produce of butter, taking ten cows, where the milk of each cow has been churned *separately*, and where the whole milk of the same ten cows has been churned *together*, with a statement of the difference in expence incurred by the separate churning. This to be done once at any period of the twelve months.

2. The whole cows must remain without change during the trial, unless where a fresh cow is required, from death or severe accident. The quality, value, and mode of preserving and making the cheese or butter produced, and of consuming the whey, &c. must be stated; also the value and age of the pasture used, and the nature of the soil; whether the cows are at all fed in the house, and upon what description of food? whether they are put out during the night in summer where soiling has been adopted? and, whether they have been put out during the day, or any part of it, in winter? also, the expences, profits, description of dairy utensils, with any other circumstances which may appear material, are required to be stated.

For the purpose of obtaining the utmost possible precision and authenticity of results, the Society has appointed Norman Lockhart, Esq. Carnwath House, one of the Society's Directors, to act as Convener in regard to these premiums in the county of Lanark, with power to call upon any two or more Members of the Society in the county, to co-operate with him in visiting and inspecting, in such manner, and at such times, as he shall appoint, and to take regular affidavits from competitors regarding the reports made.

Printed forms of reports will be ready for delivery by Mr Lockhart any time after 20th April, on or before which day, intending competitors must lodge with him an intimation of their intention to compete. Reports, certified by the Convener, must be lodged with the Secretary, at the Society's Hall, on or before 1st June 1830.

These premiums have already been given successively in districts comprehending the counties of Edinburgh, Haddington, Linlithgow, Stirling, Dumbarton, Renfrew, Berwick, Roxburgh, Selkirk, Peebles, Dumfries, and Ayr. They are now offered in the county of Lanark; and, in consequence of a liberal vote from the district, are there given to double the usual amount. The Society has in view afterwards to extend the premiums to such other districts of the country as the resident members may think would be benefited by them.

2. CURING BUTTER.

DISTRICT—*The Parishes of Kirkmichael, Inveravon, Aberlour, Mortlach, Botriphnie, and Boharm, in Banffshire, and of Rothes and Knockando, in Elginshire.*

The Premiums given, and regulations established in the county of Aberdeen, for promoting an improved system of Curing Butter, having been productive of the best results, the following Premiums are offered in the district above described:

To the Tenant who shall make and cure the largest quantity of the best quality of butter for the market, not being less than Eighteen imperial stones, being equal to ten and a half stones Banffshire weight, during the season 1830—Eight Sovereigns.

For the second greatest quantity, as aforesaid—Five Sovereigns.

For the third greatest quantity, as aforesaid—Four Sovereigns.

For the fourth greatest quantity, as aforesaid—Three Sovereigns.

CONDITIONS.

The Butter must be certified on oath to have been made and cured on the competitor's farm, during the season 1830; the quantities are to be stated in imperial stones of 14 lbs. avoirdupois; and the affidavit must bear, that the sample of one or more Kits produced, is a fair average of the quantity made and cured as aforesaid. It shall be inspected by a Committee of the Members of the Society resident within the district, at a meeting to be called by the Conveners for that purpose, at Charlestown of Aberlour, on such day as the Conveners may appoint. A Report of the award of the Premiums to be lodged with the Secretary of the Society, on or before 10th December 1830. G. Macpherson Grant, Esq. of Ballindalloch; in his absence, R. Wharton Duff, Esq. of Orton, and P. Stewart, Esq. of Auchlunkart, to be Conveners.

The Convener has undertaken, on application to him, to furnish intending Competitors with a copy of Observations on Making, Curing, and Casking of Butter, prepared originally by the Agricultural Association of Aberdeenshire.

CLASS VII.

COTTAGES.

1. PREMIUMS TO COTTARS FOR THE CLEANLIEST KEPT COTTAGE.

DISTRICTS.

1. *The Counties of Ross and Cromarty.*
2. *The County of Dumfries.*
3. *The County of Inverness.*
4. *The Stewartry of Kirkcudbright.*

In order to excite the attention of cottagers to keeping their cottages neat and clean, Ten Premiums of Two Sovereigns each, will be awarded to *Ten* Cottagers in *each* of the above districts, paying L.5 of rent or under—or whose cottage and land annexed to it does not exceed that annual value—who shall be certified by two members of the Society, resident in the district, or by one member of the Society and the clergyman of the parish, to have been distinguished for the general neatness and cleanliness of the interior as well as exterior of his or her cottage (including the garden, should there be one attached to it), and to be *deserving*, on that account, of this mark of the Society's approbation.

CONDITIONS.

The certificate must bear, that the cottage has been personally inspected by the parties granting it, and must give some description of the merits of the cottager, in respect of the manner in which the cottage, as well as the immediately adjoining space, have been kept, specifying, at the same time, the name, designation, and residence of the competitor. For the First and Second Districts, the certificates must be transmitted to the Secretary of the Society on or before the 10th of November 1829, and for the Third and Fourth, on or before the 10th November 1830.

Should there be more than ten Competitors in each district, the Society will be influenced by the circumstances of the case in deciding what claims are to be preferred: but, in every case, their decision will have regard exclusively to the neatness and cleanness with which the cottage, and immediately adjoining space, have been kept, and not to the construction of the cottage, or the materials of which it is composed.

2. PREMIUMS TO COTTAGERS FOR PROMOTING ATTENTION TO THE CULTIVATION AND MANAGEMENT OF BEES.

DISTRICTS.

1. *The Counties of Perth and Forfar.*
2. *The Counties of Dumbarton, Argyle and Bute.*

To the Cottager in the first District, paying L. 5 of rent or under, or whose cottage and land annexed to it does not exceed that annual value, who, between 1st of June and 1st October 1829, shall have raised the greatest number of Hives of Bees, not fewer than seven, from stocks his or her own property, none of the hives weighing under 20 lb. exclusive of the weight of the material of the hive or skep—A premium of Five Sovereigns.

To the Cottager in the same District who shall have raised the second greatest number, as aforesaid—Three Sovereigns.

To the Cottager in the same District who shall have raised the third greatest number, as aforesaid—Two Sovereigns.

Certificates of the number of Hives, and their several weights, making allowance for the weight of the skeps (which are to be weighed before being used), signed by two members of the Society, resident in the neighbourhood, or by one member and the clergyman of the parish, to be transmitted to the Secretary on or before 10th November 1829.

Similar Premiums will be given in the Second District for Hives raised between the 1st June and 1st October 1830.

CLASS VIII.

WOODS AND PLANTATIONS.

1. HONORARY PREMIUM FOR PLANTING.

To the Proprietor who shall communicate to the Society, on or before the 10th of November in any year, a satisfactory Report on the Planting of Land, founded on experiment; and who shall accordingly have planted on his own property an extent of not less than one hundred and fifty acres, within a period of five years preceding the date of his report—The Gold Medal.

It is required that the report shall relate more especially to the tract of land which forms the subject of the communication, detailing the necessary particulars regarding its soil, climate, and exposure; the kinds, age, and number of the plants used; the mode of planting adopted, and the expences of the work;—and the writer is invited to state those more general observations on the principles and practice of planting, which his knowledge and experience on the subject may enable him to communicate.

2. RAISING THE PINUS SYLVESTRIS FROM NATIVE SEED.

To the Nurseryman, or other person in Scotland, who shall, between the 30th October 1826 and 30th October 1829, have raised on rather poor nursery-ground, and sold for planting, the greatest number of plants, not being fewer than three millions, of the *Pinus Sylvestris*, from seed imported from Norway, and taken off healthy trees in that country, or taken off healthy and free growing trees of the natural grown pine in the Highland districts of the counties of Aberdeen, Moray, and Inverness—Twenty Sovereigns, or a Piece of Plate of that value.

For the second greatest quantity as aforesaid—Ten Sovereigns.

Competitors to transmit to the Secretary of the Society, on or before 10th November 1829, affidavits in support of the collection of the seed, specifying the quantity, and the district in which it was collected—certificates, signed by two members of the Society, specifying the soil and thriving state of the plants in the nursery-ground and an affidavit of the number of plants sold to be planted out for timber, and to whom they are disposed of. Competitors are requested to attend to a paper on the *varieties* of *Pinus sylvestris*, by the late Mr Don of Forfar, published in the Memoirs of the Caledonian Horticultural Society, vol. i. p. 121.

3. RAISING LARCH FROM NATIVE SEED.

To the Nurseryman or other person in Scotland, who shall, between 30th October 1826 and 30th October 1829, have raised and sold for planting the greatest number of plants, not being fewer than one million, of the *Pinus Larix*, or Larch Fir, from seed imported from the Tyrol, or other regions of the Alps to which it is indigenous, and taken off healthy trees in that country—Thirty Sovereigns, or a Piece of Plate of that value.

For the second greatest quantity as aforesaid—Ten Sovereigns.

Certificates similar to those for the *Pinus sylvestris* to be transmitted on or before 10th November 1829.

4. PLANTING ASH OR SCOTCH ELM FOR TIMBER.

To the Proprietor in Scotland who, from 1st October 1826, to 1st November 1829, shall have planted the greatest number, not less than ten thousand, of Ash (Fraxinus excelsior), or of Scotch Elm or Wych Elm (Ulmus montana), and effectually fenced the same, in order to raise Timber—A Piece of Plate of the value of Twenty Sovereigns, with a suitable inscription.

For the second greatest number as aforesaid—A Piece of Plate of the value of Ten Sovereigns.

Certificates subscribed by two Members of the Society, specifying the healthy condition of the plants, the nature of the ground, the kind of fence, and the expence thereof, and supported by an affidavit from the person who superintended the planting, specifying the number of trees, and the age at which they were planted (not to be less than two year old seedlings, at least one year transplanted in the nursery-ground), with the mode of planting them, to be transmitted to the Secretary of the Society on or before 10th December 1829.

In the event of no sufficient competition for the Premiums Nos. 2 and 3, within the period now fixed, the Society has it in view to extend the period.

CLASS IX.

IMPLEMENTS OF HUSBANDRY AND USEFUL MACHINES.

To the Person who shall invent or improve any Instrument or Machine applicable to Husbandry or Rural Economy, and which, from its utility in saving labour or expence, simplicity and cheapness of construction, or other circumstances, shall be deemed by the Society deserving of public notice—The Silver Medal, or such sum in money as the communication shall appear to deserve.

The account of the implement must be accompanied by a model, to be deposited in the Society's Museum.

CLASS X.

GENERAL SHOW OF LIVE STOCK,

AND

AGRICULTURAL MEETING AT PERTH IN 1829.

The Society having resolved to continue a General Show of Live Stock, Exhibition of Implements, and Roots and Seeds for Agricultural Purposes, and having fixed the Meeting to be held at Perth in the present year, the following Premiums are offered to be then awarded by the Society, aided by a donation of Fifty Guineas from the City of Perth, and liberal votes from local Agricultural Associations, connected with the adjoining districts. The Stock to be shewn must have been reared and fed by proprietors or tenants in Scotland, and *bona fide* the property of the exhibitors.

CATTLE.

SHORT-HORN BREED.

Class I. For the best Bull, of the pure short-horn breed, not under two, and not exceeding six years old—Fifteen Sovereigns, or a Piece of Plate of that value.

II. For the best Cow, of the same breed, not under four, and not exceeding eight years old—Ten Sovereigns, or Plate of that value.

III. For the Ox, of the same breed, shewing most symmetry, fat, and weight, not exceeding four years old—Ten Sovereigns, or Plate of that value.

IV. For the Ox, of any breed crossed with the short-horn, showing most symmetry, fat, and weight—Ten Sovereigns, or Plate of that value.

V. For the best two Heifers, of the pure short-horn breed, not exceeding thirty months old—Ten Sovereigns, or Plate of that value.

ANGUSSHIRE BREED.

VI. For the best Bull of the Angus breed, not exceeding six years old—Fifteen Sovereigns, or a Piece of Plate of that value.

VII. For the best breeding Cow, not under four, and not exceeding eight years old—Ten Sovereigns, or Plate of that value.

VIII. For the best pair of Oxen of the Angus breed, shewing most symmetry, fat, and weight—Ten Sovereigns, or Plate of that value.

ABERDEENSHIRE BREED.

IX. For the best pair of Oxen of the Aberdeenshire breed, shewing most symmetry, fat, and weight—Ten Sovereigns, or Plate of that value.

HIGHLAND BREED.

X. For the best Bull of the Highland breed, not exceeding five years old—Fifteen Sovereigns, or a Piece of Plate of that value.

XI. For the best breeding Cow, not under four, and not exceeding six, years old—Ten Sovereigns, or Plate of that value.

XII. For the best two Oxen, not under five, and not exceeding six, years old, shewing most symmetry, fat, and weight—Ten Sovereigns, or Plate of that value.

XIII. For the best two Heifers, not exceeding forty months old—Ten Sovereigns, or Plate of that value.

XIV. For the best two Oxen which have never been housed, not exceeding forty months old—Ten Sovereigns, or Plate of that value.

FIFESHIRE BREED.

XV. For the best breeding Cow, not under four, and not exceeding eight, years old.—Ten Sovereigns, or a Piece of Plate of that value.

XVI. For the best pair of Oxen, not exceeding five years old—Ten Sovereigns, or Plate of that value.

AYRSHIRE BREED.

XVII. For the best Bull of the Ayrshire breed, not under 24, nor exceeding 60 months old—Fifteen Sovereigns, or a Piece of Plate of that value.

XVIII. For the best breeding Cow, not under four, and not exceeding eight years old—Ten Sovereigns, or Plate of that value.

SHEEP.

LEICESTER BREED.

XIX. For the best Tup, not under 20 and not exceeding 60 months old—Ten Sovereigns, or Plate of that value.

XX. For the best Pen of three Ewes, not exceeding four years old—Five Sovereigns.

XXI. For the best Pen of three Wedders not exceeding three years old—Five Sovereigns.

SOUTHDOWN BREED.

XXII. For the best Tup, not under 20 and not exceeding 60 months old—Ten Sovereigns, or Piece of Plate of that value.

XXIII. For the best pen of three Ewes, not exceeding four years old—Five Sovereigns.

XXIV. For the best Pen of three two-shear Wedders—Five Sovereigns.

BLACKFACED BREED.

XXV. For the best Tup of the black faced breed, not exceeding 60 months old—Ten Sovereigns, or Plate of that value.

XXVI. For the best Pen of three Ewes, not exceeding four years old—Five Sovereigns.

XXVII. For the best pen of three Gimmers—Five Sovereigns.

XXVIII. For the best Pen of three fat Wedders, not exceeding five years old—Five Sovereigns.

XXIX. For the best Pen of three fat Wedders, of any cross with the black faced breed, not exceeding four years old—Five Sovereigns.

PIGS.

XXX. For the best Boar—Five Sovereigns.

XXXI. For the best Sow—Five Sovereigns.

HORSES.

XXXII. For the best breeding Mare for agricultural purposes —Ten Sovereigns, or Plate of that value.

XXXIII. For the best three year old entire Colt, ditto—Ten Sovereigns, or Plate of that value.

XXXIV. For the best three year old Filly—Five Sovereigns.

XXXV. For the best Mare not exceeding fourteen hands three inches, adapted to agricultural purposes in those Highland and Mountainous districts adjoining to or within the range of the Grampians—Ten Sovereigns, or Plate of that value.

XXXVI. For the best three year old Colt, of the same breed —Five Sovereigns.

XXXVII. For the best pair of four year old Geldings, fit for coach or chariot, and bred in the county of Perth—Twenty Sovereigns.

EXTRA STOCK, IMPLEMENTS, ROOTS, AND SEEDS.

Premiums in like manner, for Extra Stock and Roots, Seeds, and for Agricultural Implements, or ingenious Machines of any kind, applicable to the uses of Agriculture, to the value in whole of Twenty Sovereigns.

GENERAL REGULATIONS FOR THE SHOW.

1. The Competition will take place at Perth, on Wednesday the 7th of October next.

2. The name, residence, and post town of the Exhibitor, the name of the Breed, the number of the Class in which the Animals are to be exhibited, their age, and, in the case of Fat Stock, the kind of food upon which they have been fed, must be regularly certified, and the Certificate, signed by the Exhibitor, must be duly lodged as required by Article 3d.—The name and residence of the Breeder, and the Pedigree of the Stock, as far as known, must also be given.

3. The certificates must be lodged with the Secretary before 12 o'clock on Thursday the 1st of October, at which time a list will be made up by him; and no stock will be allowed to enter into competition, or to be shown, which is not included in that list. *Printed forms* of certificates may be had on application at the Society's Hall, No. 6. Albyn Place, Edinburgh, or of James Murray Patton, Esq. and R. Hope Moncrieff, Esq. Perth. On or before Wednesday the 30th September, the Secretary will be at Perth, to answer enquiries, attend to details, and to receive certificates. In the mean time, certificates may be lodged with him at Edinburgh, or with J. M. Patton, Esq. at his office, County Buildings, Perth.

4. A responsible person, on the part of the Exhibitor, must attend when the Certificates are lodged, to give explanation, if it should be necessary, and receive instructions as to matters of detail at the Exhibition. The person or persons so attending must be acquainted with the various particulars required to be certified regarding the Stock of which they are in charge, more especially the mode of feeding in the case of Fat Stock; and it shall be competent to the Committee to require the Exhibitor, or the person in charge of the Stock, to confirm the Certificates upon oath on the day of Competition, in such cases as they think necessary.

5. A ticket or order will be delivered by the Secretary to the person in charge of each lot, for its being received into the Show Yard; and no Stock whatever can come within the premisses without such warrant. One servant only for each lot can be admitted, and who must afterwards continue

in charge of that lot in the Show Yard. *Bulls* must be secured by a ring or screw in the nose, with a chain or rope attached, otherwise they cannot be admitted into the Show Yard.

6. The *Oxen* exhibited for the Premiums must not have been fed on distillery wash or grains; and the *Sheep* must have been no otherwise fed than on grass, turnips or hay. The description of food upon which the *Pigs* have been fed must be mentioned.

7. The distance each Ox travels to the Show, and the date of being put to fatten, to be mentioned.

8. A competitor may show more than one lot in any class, but shall not gain more than one Premium for Stock in the same class. It shall not be competent to enter a lot in one class, and afterwards to withdraw it for competition in another, unless by directions of the Committee. An animal having already gained the first prize in his class, at any of the Society's *General* Shows of Stock, which have been held at Edinburgh and Glasgow, is not to be shewn again in competition in the same class,—but may be exhibited as Extra Stock, or entered for Sweepstakes.

9. Gentlemen intending to exhibit *Extra Stock*, must likewise intimate to the Secretary, and describe the Stock to be shown, six days before the competition. *Sweepstakes* to be reported in due time, in order that proper Judges may be appointed, and other necessary arrangements made.

10. The Stock exhibited will not be distinguished in the Show Yard by the name of the breeder, feeder, or owner (until after the premiums are decided), but by Tickets or *Numbers* to be affixed to each lot, corresponding to the list to be made up by the Secretary.

11. The Committee of the Society appointed to conduct the arrangements for the Show, will appoint skilful persons to act as Judges for the several classes, and to report to the Committee the lots which, in their opinion, are entitled to the premiums.

12. The Committee of the Society, and the Judges to be named by them, will begin to view the Stock on the 7th October, at ten o'clock A. M. precisely; and, to prevent confusion, the different lots must be brought to the ground at or before eight o'clock in the morning.

13. On their arrival at the gate, instructions will be given as to the particular part of the Show Yard to be occupied by each Class. The Stock will be withdrawn and the Show Yard shut at four o'clock.

14. Persons intending to exhibit Implements, Roots, or Seeds, must communicate with the Secretary, and lodge with him a memorandum descriptive of the articles to be shown, at least five days before the Meeting.

Finally, no change can, under any circumstances, be made upon the General Regulations established by the Society for Agricultural Meetings and General Shows of Live Stock, unless regularly submitted and approved off at a meeting of the Directors in Edinburgh, and duly intimated to Competitors.

The following Members of the Society are appointed a Committee for regulating all details connected with the Agricultural Meeting, and Show of Stock, at Perth, viz.

Duke of Atholl; Earl of Moray; Earl of Kinnoul; Earl of Airlie; Earl of Leven and Melville; Earl of Breadalbane; Earl of Mansfield; Lord Elcho; Lord Viscount Glenorchy; Lord Viscount Strathallan; Lord Gray; Lord Ruthven; Lord Nairne; Lord Gwydir; Lord Abercromby; Lord Lynedoch; Count Flahault; Hon. D. Gordon Hallyburton of Pitcur; Hon. W. Maule, M. P.; Hon. John Gray; Hon. John Stuart, M. P.; Right Hon. Sir George Murray K. C. B. M. P.; Sir Neil Menzies, Baronet; Sir John A. Stewart, Baronet; Sir James Ramsay, Baronet; Sir Patrick Murray, Baronet; Sir David Moncrieff, Baronet; Sir A. Muir Mackenzie, Baronet; Sir David Baird, Baronet; Sir Robert Dundas, Baronet; Hon. Lord Balgray; Hon. Baron Clerk Rattray; John Lee Allan, Esq. of Errol; Alexander Murray Belches, Esq. of Invermay; John Boswell, Esq. of Balmuto; Principal Baird; Archibald Butter, Esq. of Pitlochry; R. Craigie, Esq. of Glendoick; Robert Clark, Esq. of Comrie; H. Home Drummond, Esq. M. P.; Adam Drummond, Esq. of Megginch; Robert Fergusson, Esq. of Raith; Robert Graham, Esq. of Redgorton; John Grant Esq. of Kilgraston; Robert Græme, Esq. of Garvock; P. Small Keir, Esq. of Kinmonth; James L'Amy, Esq. of Dunkenny; James Moray, Esq. of Abercairney; Anthony Murray, Esq. of Crieff; William Macdonald, Esq. of St Martins; Andrew Murray, Esq. of Murray's Hall; Anthony Maxtone, Esq. of Cultoquhy; George Paterson, Esq. of Castle Huntly; John Richardson, Esq. of Pitfour; James Stirling, Esq. of Keir; Robert Smythe, Esq. of Methven; General Graham Stirling of Duchray; William Stewart, Esq. of Ardvorlich; P. Murray Threipland, Esq. of Fingask; William Trotter, Esq. of Ballindean; Captain Wemyss of Wemyss, M. P.: James Wright, Esq. of Lawton. The Honourable D. Gordon Hallyburton, Convener.

A deputation of the Directors of the Society will be at Perth two days before the Meeting.

FORM OF CERTIFICATE ABOVE REFERRED TO AS APPLICABLE TO FAT OXEN.

I near in the county of , do certify, That my Ox (or Oxen, as the case may be), of the breed, to be shewn for the Premium in Class was bred by Mr of ;—he is now years and months old, and was fed by me on and has not, at any time, been fed on distillery wash or grains. He will have to travel miles or thereby, from the place of feeding to the Show at Perth. He was first put up to fatten on or about the day of

Witness my hand this day of 1829.

Signature of the Exhibitor.

CLASS XI.

GENERAL SHOW OF LIVE STOCK AT DUMFRIES, IN 1830.

The Society having resolved to hold the General Show of Live Stock for 1830 at Dumfries, the following Premiums are offered to be then awarded by the Society, aided by liberal votes from the counties of Dumfries, Kirkcudbright, and Wigton, and from the Town of Dumfries.

CATTLE.

GALLOWAY BREED.

CLASS I. For the best Bull, of the Galloway breed, not under two, nor exceeding six years old—Fifteen Sovereigns, or Plate of that value.

For the second best ditto—Seven Sovereigns.

II. For the best two Oxen, of the Galloway breed, not under three years old, shewing most symmetry, fat, and weight—Ten Sovereigns, or Plate of that value.

III. For the best two spayed Heifers, of the Galloway breed, not under three years old, shewing most symmetry, fat, and weight—Ten Sovereigns, or Plate of that value.

IV. For the best breeding Cow, of the Galloway breed, not under three years old—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

V. For the best two Queys, of the Galloway breed, not exceeding thirty-three months old—Ten Sovereigns.

For the second best two ditto—Five Sovereigns.

VI. For the best lot of Stirks, of the Galloway breed, not exceeding twenty-one months old, and not under one-half of those bred on the farm, nor fewer than five in number—Ten Sovereigns.

Note.—In Classes I. IV. V. and VI. regard to be had to symmetry and size only.

AYRSHIRE BREED.

VII. For the best Bull, of the Ayrshire breed, not under two, and not exceeding six years old—Ten Sovereigns, or Plate of that value.

VIII. For the best Milch Cow, of the Ayrshire breed, not under three years old—Ten Sovereigns.

IX. For the best two Queys, of the Ayrshire breed, not exceeding thirty-three months old—Five Sovereigns

WEST HIGHLAND BREED.

X. For the best Ox, of the West Highland breed, not under three years old, shewing most symmetry, fat, and weight—Ten Sovereigns, or Plate of that value.

For the second best ditto—Five Sovereigns.

SHORT-HORN BREED.

XI. For the best Ox, of the pure short-horn breed, shewing most symmetry, fat, and weight—Ten Sovereigns, or Plate of that value.

ANY BREED.

XII. For the best Ox, of any breed, pure or cross, the particulars of the breed and age being specified—Ten Sovereigns.

SHEEP.

LEICESTER BREED.

XIII. For the best Tup, of the Leicester breed, not under twenty, nor exceeding forty-eight months old—Ten Sovereigns.

XIV. For the best Pen of three Ewes, of the Leicester breed, not exceeding four years old—Five Sovereigns.

XV. For the best Pen of three fat Wedders, of the Leicester breed, not exceeding three years old—Five Sovereigns.

CHEVIOT BREED.

XVI. For the best three Tups, of the Cheviot breed, not exceeding forty-three months old—Ten Sovereigns.

For the second best three ditto—Five Sovereigns.

XVII. For the best Pen of ten Ewes, of the Cheviot breed, not exceeding six years old, selected from a regular breeding Stock of not less than 200 rearing lambs of that season, till the middle of July, and being kept with the rest of the Stock till at least the Whitsunday preceding—Five Sovereigns.

XVIII. For the best Pen of five fat Wedders, of the Cheviot breed, not exceeding five years old—Five Sovereigns.

Note.—In Classes XVI. and XVII. regard to be had to the wool, as well as to the symmetry and weight of the carcass.

BLACK-FACED BREED.

XIX. For the best three Tups of the black-faced breed, not exceeding forty-three months old—Ten Sovereigns.

XX. For the best Pen of ten Black-faced Ewes, not exceeding six years old—Five Sovereigns.

XXI. For the best Pen of five fat Wedders, of the Black-faced breed, not exceeding five years old—Five Sovereigns.

CROSS-BREED.

XXII. For the best Pen of three fat Wedders, of any cross, the particulars of the *Cross* being specified, not exceeding forty-eight months old—Five Sovereigns.

PIGS.

XXIII. For the best Boar, not under twelve months, nor exceeding four years old—Eight Sovereigns.

For the second best ditto—Five Sovereigns.

XXIV. For the best Breeding Sow, not under twelve months, and not exceeding four years old—Six Sovereigns.

For the second best ditto—Four Sovereigns.

XXV. For the best two Pigs, not exceeding forty weeks old—Five Sovereigns.

Note.—The award of the Premiums in these three Classes to be with reference to the production of Bacon.

HORSES.

XXVI. For the best Stallion, from three to twelve years old, for the improvement of the Breed of Draught-Horses—Ten Sovereigns, or Plate of that value.

XXVII. For the best Stallion, from three to twelve years old, for breeding horses for coach or chariot—Ten Sovereigns, or Plate of that value.

Note.—It is required that the Stallions produced in competition for the Premiums in these two Classes shall have served in the district for the season preceding the day of competition.

XXVIII. For the best Mare, not exceeding twelve years old, for breeding draught-horses, and which shall have been at least one year in the possession of the competitor—Ten Sovereigns.

XXIX. For the best Mare, not exceeding twelve years old, for breeding horses for coach or chariot, and which shall have been at least one year in the possession of the competitor—Ten Sovereigns.

XXX. For the best three year old Draught-Gelding or Filly —Five Sovereigns.

EXTRA STOCK, IMPLEMENTS, ROOTS AND SEEDS.

For Extra Stock of any kind, not shewn for any of the above Premiums, and not exceeding in one lot, five Cattle, or ten Sheep, and for Implements of Husbandry, Roots and Seeds, honorary Medals or Premiums will be awarded, to the value in all of Thirty Sovereigns.

SWEEPSTAKES PROPOSED,

ONE GUINEA EACH,

To close, and name to the County-Clerks of the counties of Dumfries, Wigton and Kirkcudbright,—to the Town-Clerk of Dumfries,—or to the Secretary of the Society in Edinburgh, before the 1st day of May 1830.

Stock to be entered for the Premiums may also be entered for the Stakes.

1. For the best Galloway Bull, two years old and upwards.
2. For the best Galloway Bullock.
3. For the best Spayed Heifer of the Galloway breed.
4. For the best Galloway Quey.
5. For the best Ox of the Ayrshire breed.
6. For the best Ayrshire Milch Cow, not under four years old.
7. For the best Draught Stallion, two years old and upwards.
8. For the best Draught Mare.
9. For the best Boar.
10. For the best Brood Sow.
11. For the best Three Black-faced Wedders.
12. For the best Three Cheviot ditto.
13. For the greatest variety and best quality of Stock *bona fide* fed and exhibited by any one competitor.

GENERAL REGULATIONS FOR THE SHOW.

1. The Competition will take place at Dumfries on Tuesday the 23d September 1830.

2. The Competing Stock must have been the property, and in the possession of the Competitors from the 1st January 1830; they must have been fed solely on farm produce,—but under the exception of distillery wash or grains, which can be accessible only to a very few Competitors.

3. The usual rules and regulations of the Society, with regard to Shows of this kind, in so far as applicable to the Dumfries Meeting, and which will be published in detail in due time, must also be strictly adhered to. In [illegible]ating the ages of stock, where months are specified, they are not, on the day of competition, to be *over* the number of months limited.

THE VETERINARY SCHOOL.

This establishment is now in its sixth year of operation, under the Lecturer appointed by the Society, Mr Dick, a graduate of the Veterinary College of London. Its practical utility has already been fully ascertained. Young men from various parts of the country have received instruction in the most approved and scientific modes of shoeing, in the anatomy and diseases of the horse, and other domestic animals, and in the best system of treatment and cure: Several of these students have been sent up by Agricultural Associations, and others have attended on their own account. It may be interesting also to Members of the Society to be informed that Mr Dick, last season, delivered a set of Lectures, at a forenoon hour, to a numerous class of gentlemen, with such success, that a similar course is in progress in the present Session, and will probably also become an annual course.

The Lectures and Demonstrations for the Session 1829-1830, will be commenced in November next, at the usual Lecture-room in Edinburgh.

By order of the Directors,

CHARLES GORDON, *Dep. Secretary.*